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11 YEARS

THE COLOR COMPUTER MONTHLY MAGAZINE

October 1991 Vol. XI No. 3

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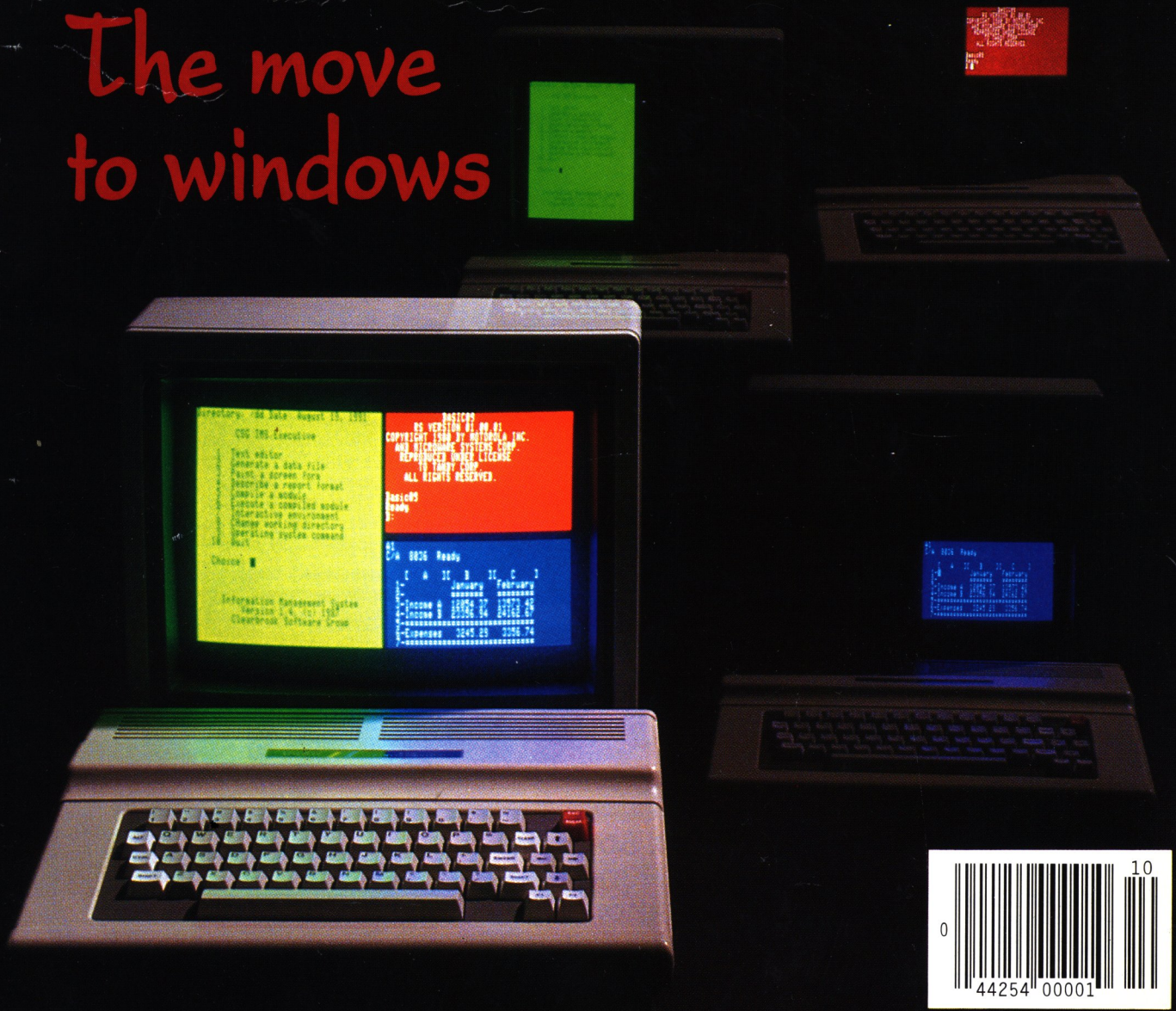

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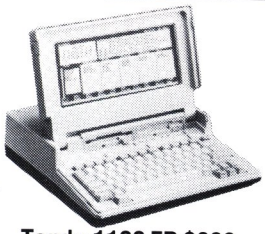

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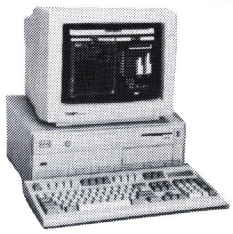

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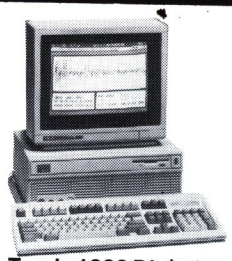

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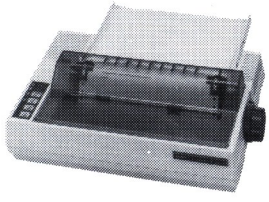

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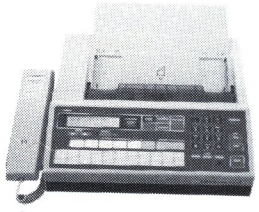

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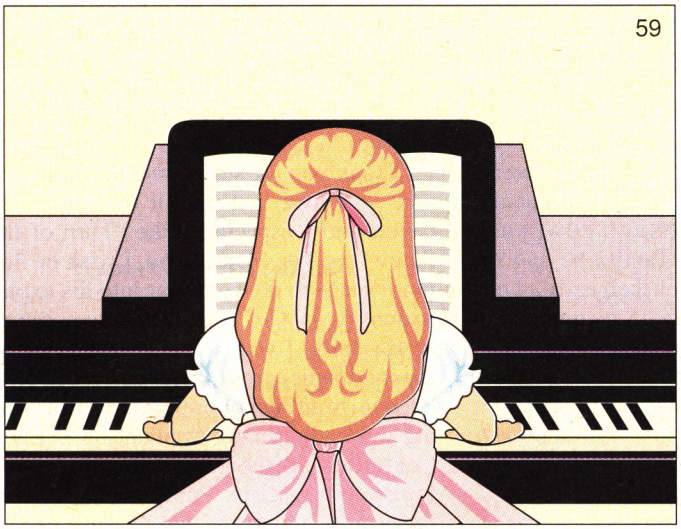

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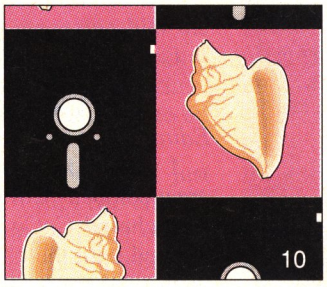

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Associate Editor Sue Fomby
Submissions/Reviews Editor Tony Olive
Technical Editor Greg Law
Technical Assistants Ed Ellers, Gregory Shultz
Editorial Assistant Julie Hutchinson
Contributing Editors
Tony DiStefano
Martin Goodman, M.D.
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Consulting Editors Judi Hutchinson, Laurie D. Falk
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Letters to the RAINBOW

What If?

Editor:

Thanks for the beautifully framed copy of "Print#-2." It will be greatly treasured, along with all my other CoCo "stuff." But I think if anyone should be receiving gifts and kind words, Lonnie Falk belongs near the top of the list. It's been people like you, Dennis Kitsz, Tom Mix, and Marty Goodman that have really put life into the CoCo.

If I had a big enough cosmic spreadsheet, I would love to play a "what if?" game. If it wasn't for THE RAINBOW, where would the CoCo (and Tandy) be now? If Mark Data hadn't written their early adventure games, such as *Black Sanctum*, would I have written my *Ship Wreck* adventure and gotten as involved with the CoCo as I have?

Steve Ostrom
Minneapolis, Minnesota

A Supporting Cast

Editor:

I want to let your readers know what a great company Colorware is. A while back I purchased *CoCo Max III* and *Max-10*. I worked with the programs for a few days then set them aside. When I tried to use *Max-10* about a month later, I found I had reformatted my working copy. I could not get a "new" copy of *Max-10* to work because of a missing file. I called Colorware, and they replaced the disk even though the warranty had expired. I believe that service so far above everyday expectations should be mentioned.

Walter Jones
Georgetown, Delaware

Wants Cheap MPI

Editor:

I am looking for a device that will let me connect my disk drive and DC Modem Pak to the CoCo at the same time. I have considered a Y cable because I don't want to spend a lot of money. What is your opinion of using a Y cable. Has William Barden presented a project that would allow me to use both things at the same time?

Aaron Farmer
2055 Burke Road
Ukiah, CA 95482

Our concern about using a Y cable to connect multiple devices is that the CoCo power supply is pretty taxed as it is. Other multi-slot devices provide external power. However, as long as you remove the ROM from the DC Modem Pak it should work. For more information, see Pete Fansler's letter in this month's "CoCo Consultations." Also read the following articles by Marty Goodman: "RS-232 Retrofit" (July 1991, Page 10) and "Upgrade Your Multi-Pak!" (this issue, Page 52).

Plug 'n' Power Again . . .

Editor:

Thank you for such a wonderful magazine — I love it. I read it from cover to cover, and I especially like "Turn of the Screw" by Tony DiStefano. I wish he had more space to delve deeper into his explanations of the CoCo's interfacing abilities.

Recently, I was reading some back issues and came across a reference (May 1988, Page 16) to an "upcoming" article on how to use the Radio Shack Appliance and Light Controller with the CoCo 3. I am very sorry I missed this article. Could you tell me the issue(s) in which the article appeared? I have the ROM Pak for the Appliance and Light Controller but cannot make it work with my CoCo 3.

Alan Doherty
Marstons Mills, Massachusetts

Sorry. We had anticipated publishing such an article at that time. Unfortunately none of our leads bore fruit. We would certainly consider publishing the article if someone submits it.

. . . and Again

Editor:

I have a 512K CoCo 3 and a CM-8 Monitor. I also have a Plug 'n' Power Appliance and Light Controller that I can not use with the CoCo 3. I have to drag out my CoCo 2 and a color TV in order to change the time settings on the unit. Is there anything I can do in order to use the controller with the CoCo 3?

Bob Kemether
Bricktown, New Jersey

We don't have an immediate solution for you, Bob. However, it is obvious that people are interested. It would appear some developer could make a killing from this . . .

Loves Coverage of OS-9

Editor:

I love your articles covering OS-9 and BASIC09. Since reading Dean Bergmann's "Living Without Line Numbers" (August

1990, Page 64), I have begun to understand some of the power of BASIC09. Just the other day I was having trouble understanding the instructions in the BASIC09 manual for sending data to the printer from within a program. But THE RAINBOW came to my rescue again with a perfect example in GradeBook from "OS-9 Gets the Grades" (September 1990, Page 39). Thank you.

Eric Bailey
Moonee Ponds, Victoria
Australia

Wants CoCo 3 Tech Info

Editor:

I want to buy a Color Computer 3 technical manual, but I have not been able to because I don't know what it's catalog number is. Do you have any information that would help?

David Guilbeau
6708 N. University
Carencro, LA 70520

The CoCo 3 service manual is available from Tandy National Parts and carries the same stock number as the computer (#26-3334). You can order the manual from Tandy National Parts at any Radio Shack store, or call (817) 870-5600.

Thanks for the Help

Editor:

Many thanks for explaining the solution to an OS-9 problem I had ("OS-9 Hotline," July 1991). I've been beating my head with OS-9 for over two years, and I'm finally getting to understand it. The next challenge for me is to learn assembly language. Thanks again!

Daniel Imanski
Milwaukee, Wisconsin

We're glad we could be of service in your time of need. And we wish you the best of luck in your new quest.

Monitors and the CoCo 2

Editor:

I want to use a composite video monitor with my CoCo 2. Is there a way of converting the RF output for video? Would such a project entail more than the average hobbyist is prepared to tackle?

D'Arcy Brownrigg
P.O. Box 292
Chelsea, Quebec J0X 1N0
Canada

Read "Do-It-Yourself Video Output Board" (September 1986, Page 171) for a simple circuit that does just what you want. This easy-to-build project is a simple amplifier circuit that requires only readily available components.

In Defense of Newsstands

Editor:

I'm writing this letter to express my concern about your removing THE RAINBOW from the newsstands. I think this is a big mistake. You are the only source left for the Color Computer. I have two CoCo 3's, and I wouldn't give them up for anything. But now I guess I will have to. Let me explain. There are a lot of people like myself who can't subscribe to your magazine. It isn't that we don't want to — we can't afford to.

I know when your magazine hits the newsstands, and I'm right there to pick it up. When I went to Walden Books this time, I didn't really think you were going to do what you said. I was wrong.

I feel you are doing to the public just what Radio Shack did. It isn't bad enough that Radio Shack discontinued the CoCo 3, but now you are telling us you can't help us anymore unless we subscribe. That's not right. Just because you're a company, out to make some money, doesn't mean you turn your backs on the public — we're the people that make your money. There has to be a better way. Don't turn us away. We love you, and you're our last hope. Did you stop to think that maybe this computer is all some of us can afford?

Enough of my problems — although, my problems are your problems. It's like you are disowning us just so you can make a profit. In the long run, you are going to lose a lot of readers because we can't afford the subscription. But that's life in the fast lane. Right! Good luck.

Robert Turner, Jr.
Farmington, New Hampshire

We believe your frustration, and you certainly have a right to feel the way you do. But the decisions we make are in THE RAINBOW's best interests as a publication. Therefore, in the long run they are in our readers' best interests, as well. While there are exceptions, your case being an example, we find that most of our readers subscribe. We hope you'll find a way to subscribe, too. The $31 subscription rate may be a lot of money to some people, but it doesn't add up that $3.95 (plus tax) every month for 12 months is any cheaper.

Non-Stop Support

Editor:

My wife and I bought our first CoCo in late 1985 and started subscribing to THE RAINBOW shortly thereafter. When we bought the computer, we thought we would just "fool around" with it. Had it been just the software available from Radio Shack, we probably would have thought the CoCo to be very limited. THE RAINBOW showed us there were more capabilities to be discovered. And it still does.

The CoCo is capable of serving us well. It didn't stop working when the next greatest thing came out. Those with little income to spare can get more for less money and still get excellent results. THE RAINBOW is a valued magazine, regardless of its size, and we are thankful you are still around to make the CoCo a worthy investment.

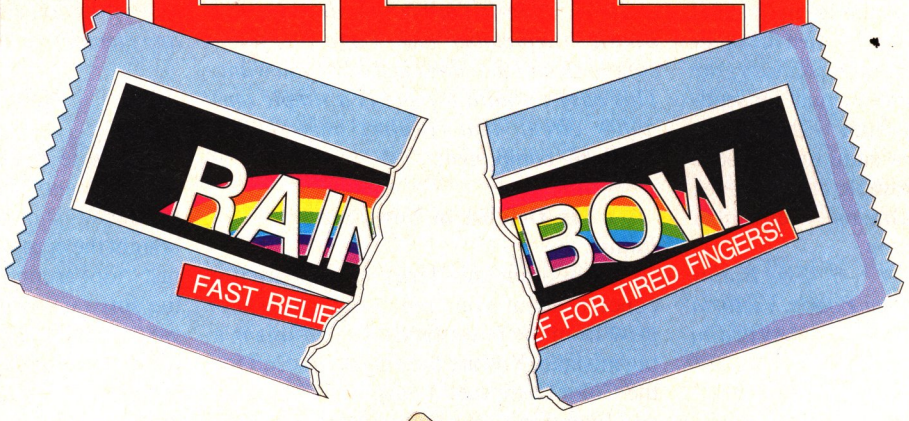
We would also like to encourage everyone to either join or start a users group that includes the CoCo. Believe it or not, there are people who think software starts and stops at Radio Shack. Some don't even know there is a RAINBOW magazine. Several people we have encountered didn't even know the CoCo could do *any* serious work. When you get these people in a room and show them the CoCo's multitasking capabilities, it's like you hit them with a hammer. If more people supported the clubs, imagine the difference it would make. Attend club meetings. If there isn't a club in your area, *start one*. And, please, everyone support THE RAINBOW and its advertisers. Thanks for letting us air our feelings!

Mr. and Mrs. Greg Adams
Sterling, Illinois

THE RAINBOW welcomes letters to the editor. Mail should be addressed to: Letters to Rainbow, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. Letters should include the writer's full name and address. Letters may be edited for purposes of clarity or to conserve space.

Letters to the editor may also be sent to us through our Delphi CoCo SIG. From the CoCo SIG> prompt, type RAI to take you into the Rainbow Magazine Services area of the SIG. At the RAINBOW> prompt, type LET to reach the LETTERS> prompt and then select Letters for Publication. Be sure to include your complete name and address.

RELIEF



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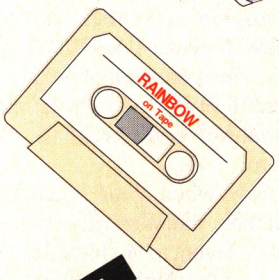

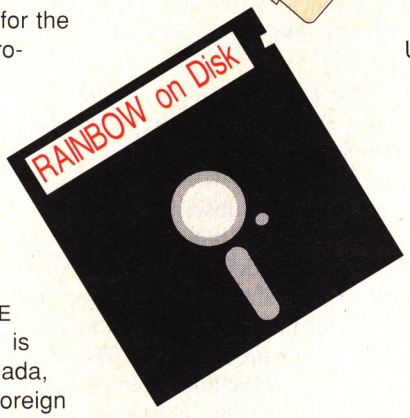

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Print#-2

A New Generation

As you may know, I end up writing these columns several months ahead of time, just as most of our editorial material is put together in advance. This is primarily due to the problems of the magazine printing industry rather than something we do. If we *could* send you our pages as we put them together, though, you'd be getting your information a lot more quickly.

The problems with deadlines is what prompts me to be in a generally jolly mood in October (when the Holiday issue deadline comes around), but sometimes it is one of the more difficult things we have to deal with here.

Right now it is very difficult because, as you saw from the September issue, we are beginning an in-depth look at the new generation of "Color Computers" with an evaluation of the System IV from Delmar. Obviously the System IV is "in house," and our technical types have been working on it for the review. We're covering it first because it was "first in," but the Frank Hogg Laboratories Tomcat is also in house now. Expect our techies to work it over and report on it in the November issue. Coverage of the MM/1 is scheduled for December.

Those are all the new computers we have. At RAINBOWfest Chicago in 1990 (now 18 months ago), two companies announced plans to make what we were calling fourth-generation computers available as new "CoCos." These companies are Frank Hogg Laboratories and Interactive Media Systems (IMS). In addition, Delmar Company introduced the System IV to the CoCo Community at the Atlanta CoCofest in October, 1990.

By far the most jazzy of the computers, at first blush, seemed to be IMS' MM/1 machine. Working with a consortium of different people, IMS was certainly the most active marketer, had the best media presentation and seemed to have every feature everyone ever wanted.

You can form an opinion as to whether you want to "move up" to one of the new computers.

By contrast, Delmar kept a pretty low profile. Its System IV was basically an industrial Motorola-68000-based system that promised the capability to run the better and faster OS-9/68000 software — all of this the "big brother" to our 6809-based CoCo. Delmar had to work out some problems in, essentially, converting an industrial computer for use by the personal-computer market. In the year that has passed, they have done just that.

In the middle of the road (promotion-wise) was Frank Hogg. His approach, interestingly, was to build a totally new computer, the Tomcat, but to allow it to go either way — as a Color Computer or as a 68000 computer. The 68000 part of the Hogg project would be accomplished by using a board which he already had available.

The Tomcat ran into many of the problems inherent to building new technology, including the perennial one that seems to infest the computer industry as a whole — "let's just add this one other thing." To his credit, Hogg never officially took orders for the Tomcat until his new board was finished. As of today, there is a Tomcat computer here at THE RAINBOW. There is a System IV. And there is an MM/1.

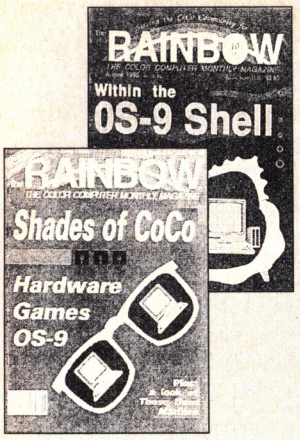
Knowing we wanted to review these new computers (or any other new computers that appeared to address the CoCo market), we set deadlines based on discussions with the manufacturers at RAINBOWfest in 1991. Essentially, we told the manufacturers we must have production machines — *real computers* — that were truly offered for sale to the general public.

Although there are a host of technical differences, schemes and philosophies between these three computers, they are all seemingly available, given some slight exceptions. We will go into these in our reviews. But you should know the MM/1 comes (as of now, anyway) in kit form, which means you have to put it together. In all honesty, this is nowhere near as difficult as it may sound.

If you have read last month's review of the System IV, and do read November's and December's scheduled reviews of the Tomcat and MM/1, you should be able to form an opinion as to whether you want to "move up" from your Color Computer to one of these systems and, if so, which one you might choose. As these computers take hold, we plan to address some 68000 issues and review 68000 software. We will do this, primarily, as we see evidence of "upward" migration to these systems. We do plan, of course, to continue our coverage of *the* CoCo and of OS-9 as well.

Should you "move up?" I'll address that issue in a future column.

— Lonnie Falk



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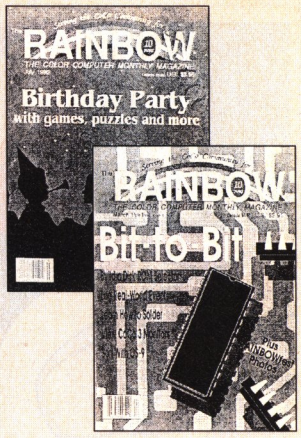

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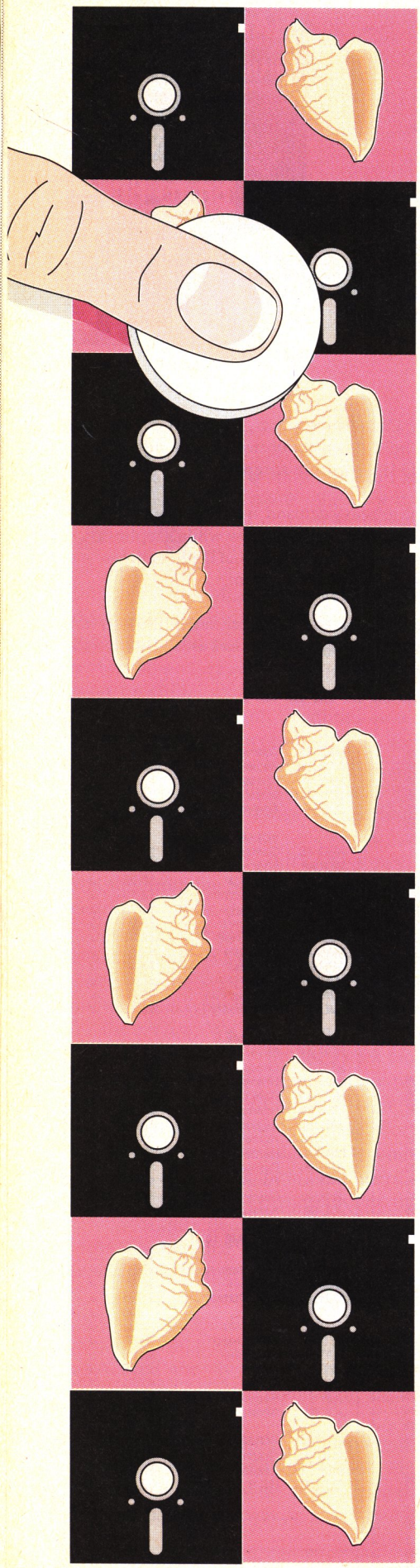

A how-to for transferring files and programs between Disk BASIC and OS-9

Making the Move

by Tim Kientzle

A major source of frustration in the CoCo community is the split between Disk BASIC and OS-9. Those who try to use OS-9 exclusively are often frustrated by the poor selection of major applications. Often they must switch back to Disk BASIC for these applications. On the other hand, OS-9 makes it easy to develop and use many small programs which can be combined to perform a wide variety of tasks. Further, the better programming tools available under OS-9 are encouraging a lot of developers to write new software for that environment rather than for Disk BASIC.

The split between OS-9 and Disk BASIC would be more tolerable if these two systems could easily read and write the same disk format. This is unfortunately not the case. However, there are several programs available that ease the transfer of files between the two disk formats. We'll look at how to set up and use the two most popular such programs, and briefly mention several others.

1. Start the computer in Disk BASIC.
2. Format a Disk BASIC disk.
3. Copy to the newly formatted disk the files you want to transfer.
4. Run `RS2OS9.BAS`. When it has finished, the disk can be read by OS-9.
5. Boot OS-9.
6. Copy the files from the Disk BASIC disk to a disk that was formatted by OS-9.
7. You can now use the OS-9 files as you want!

Figure 1: Using `RS2OS9.BAS`

What Will it Mean for Me?

Once you know how to transfer files between the systems, you'll be able to take advantage of the different programs that are available under both OS-9 and Disk BASIC. As an example, one member of a local CoCo club uses a Disk BASIC word processor to create large databases by entering one

---

Tim Kientzle is currently pursuing a doctorate in mathematics at the University of California at Berkeley. He is the author of V-Term *and has worked with the Color Computer since 1982.*

1. Get copies of `ipatch` and the `CC3Disk.ipc` file. (Both are available on the major information services and many bulletin boards.) If you download the files with a Disk BASIC terminal program, you'll need to transfer them to an OS-9 disk with `RS2OS9.BAS`, as described in the article.
2. Copy `ipatch` to your `CMDS` directory, and set the execute attributes by entering

```
attr cmds/ipatch e pe
```

3. Copy the `CC3Disk.ipc` file to your `MODULES` directory. (If you're using the standard CoCo 3 OS-9 Level II, the `MODULES` directory is on a different disk. If you have to swap disks, enter `load ipatch` so that `ipatch` will be in memory for later use, then change the disks. Remember to enter `chd /d0;chx /d0/cmds` to tell OS-9 to use the new disk.)
4. Enter `chd modules` and `dir` to get a listing of the `MODULES` directory. You should see `cc3disk.dr` and `cc3disk.ipc` listed. What we want to do is create a new `cc3disk.dr` using `cc3disk.ipc` to patch the old one.
5. Enter `rename cc3disk.dr cc3disk.old.dr` to rename the original file in case you need it at a later date.
6. Now do the actual patching by entering `ipatch cc3disk.ipc cc3disk.old.dr cc3disk.dr`, which tells `ipatch` to use the instructions in `cc3disk.ipc` to patch `cc3disk.old.dr` to get `cc3disk.dr`.
7. You now have to build a new boot disk, using either `config` or `OS9Gen`, that includes the new `CC3Disk` driver in the file `cc3disk.dr`.

Figure 2: Using `ipatch` to Create a New Driver

item on each line in a file. He then moves these databases over to OS-9 where he can use small utility programs to search the text files, sort them, or display information in particular formats. This whole setup hinges on the ability to easily move files between the two operating systems.

People trying to get started with OS-9 often find that being able to transfer files is a necessary prerequisite. A typical question on the online information services (Delphi, CompuServe, etc) comes from a person who has just downloaded an OS-9 file using a Disk BASIC terminal program, and who is trying to figure out how to use the new download with OS-9. The first step is getting the program onto an OS-9-formatted disk.

Why Are the Formats Different?

OS-9 and Disk BASIC were developed by different groups of people with different goals. It is a common misconception that OS-9 was developed for the Color Computer. If that were so, it would be reasonable to ask why OS-9 doesn't use the same disk format as Disk BASIC. In fact, the two operating systems were developed (at about the same time) for different purposes.

Disk BASIC was developed for Tandy by Microsoft. Microsoft based the disk format on a similar disk format they had successfully used for other computers. (The same ideas were used in the MS-DOS disk format.) This disk format is good for use on floppies, but lacks some features (such as support for different-sized disks and subdirectories) present on larger computers.

OS-9 was developed by Microware as a UNIX-style operating system for real-time control. Since the people developing OS-9 used large UNIX systems as a model, they came up with a very different disk format — one that readily adapts to different-sized disks, and that has heirarchical directories and other features. The fact that OS-9 was designed to be easily ported to different computers that use the 6809 microprocessor is what allowed Tandy to offer it for the Color Computer.

It is important to understand that the basic structure of tracks and sectors is the same on OS-9 disks as it is on Disk BASIC disks. The real difference in the formats is that OS-9 uses Track 0 to start its directory structure, while Disk BASIC stores its single directory on Track 17.

Enough Talk! What Do I Do?

There are two basic ways to transfer files between Disk BASIC and OS-9. The biggest difference between them is that one method uses a Disk BASIC program and the other uses an OS-9 program. The Disk BASIC route is somewhat easier to set up, and the OS-9 route is easier to use after it's already set up. We'll look at the Disk BASIC route first, since that's where most people need to start.

Pushing From One Side . . .

There are a number of Disk BASIC/OS-9 transfer programs available in the databases of the major information services. The one I'll use is `RS2OS9.BAS`, although many other versions are available (`RS-OS9.BAS`, `DOSOR9.BAS`, and other variations). All of these programs work in essentially the same way: You first put the files you want to transfer on a Disk BASIC disk. Then you run the program (in this case, `RS2OS9`), which enables OS-9 to read the files on the disk. Finally, you boot OS-9 and simply copy the files to a true OS-9 disk — one that has been formatted using the OS-9 `format` command. Figure 1 shows the steps involved in this process.

As I stated before, OS-9 and Disk BASIC use different parts of the disk to store their directory information. `RS2OS9` looks at the Disk BASIC directory information and creates enough of an OS-9 directory to let OS-9 find the files. After `RS2OS9` runs, the disk contains two directories: A Disk BASIC directory on Track 17 and an OS-9 directory on Track 0.

Be forewarned, however: *You should not write to this specially formatted disk from OS-9.* The OS-9 directory created by `RS2OS9` isn't complete, and problems may occur. Also, writing files to the disk from OS-9 won't change the Disk BASIC directory, so there's no way for Disk BASIC to know that OS-9 has stored files there. To avoid the obvious confusion of having the two systems believe that different files are on the same disk, I suggest you avoid using it like a true OS-9 disk.

There are a few common limitations to such programs, though. First, the part of the disk where the OS-9 directory will be written should be blank. Some versions of `RS2OS9` are smart enough to move any Disk BASIC files that fill that part of the disk, while some simply report an error. Still others overwrite the data on that part of the disk, thus destroying the data that you're trying to transfer. For this reason, you should always start with a freshly formatted disk, and move only a few files at a time to avoid filling Track 0.

A second limitation is that most versions

of RS2OS9.BAS build only a relatively small OS-9 directory, and can thus handle only a few files. Perhaps the most confusing limitation is that most such programs can handle only files smaller than 32K. This is due to the way that Disk BASIC handles certain file-position calculations. At least one version of RS2OS9 (in particluar, COCOOS9.BAS) has been improved to handle larger files. But if you will be transferring files often, or transferring many large files, you should probably be using one of the OS-9 utility programs to perform the transfer.

The caveats to using RS2OS9 are summarized as follows:

- Always start with a blank disk.
- Transfer only a few files at a time.
- Don't transfer files larger than 32K unless you know you have a version of RS2OS9 that can handle it.

At one time, there was a Disk BASIC program that could decipher enough of the OS-9 directory structure to read files from an OS-9 disk and write them to a Disk BASIC disk. I saw this a long time ago but unfortunately cannot remember where, and I have not been able to find it again.

. . . Pulling From the Other

There are several programs available that run under OS-9 and allow you to copy files between Disk BASIC and OS-9 disks. This obviously works best if you have two disk drives, though you can usually get by comfortably if you have one drive and a RAM disk for OS-9. Since two disk drives are strongly recommended for OS-9 use in general, I'll assume you have two.

The program I describe in this section is rsdos, which is available on both CompuServe and Delphi. The commercial OS-9 programs available for such transfers work in much the same manner as rsdos. It is worth noting that OS-9 programs to copy files between MS-DOS and OS-9 disks work very similarly, and usually the necessary setup is identical.

Some OS-9 floppy-disk drivers (an OS-9 driver is a program that knows how to talk to certain types of devices) have special abilities that let an OS-9 program read raw data from a non-OS-9 disk. If the program can read the raw data, then it can figure out the Disk BASIC directory, find the file information, and copy the file to an OS-9 disk. Unfortunately the OS-9 floppy-disk driver (called CC3Disk) supplied with OS-9 Level II doesn't have this ability. CC3Disk reports an error whenever it sees a non-OS-9 disk. To get this ability, you need to either alter CC3Disk or replace it with a third-party commercial disk driver, such as *SDisk3*, or the special drivers that come with one of the no-halt disk controllers. (Note: The Disto no-halt drivers don't support reading and writing of MS-DOS disks because of the way the hardware works in the no-halt mode, though it works fine for reading and writing Disk BASIC disks. If you want to read and write MS-DOS disks also, you'll need to use either a patched version of Tandy's CC3Disk or a commercial replacement with the controller in the normal "halt" mode.) A method for altering CC3Disk is shown in Figure 2.

Once you have modified CC3Disk or replaced it with an improved driver, you can use Bob Santy's freely-available rsdos program, or one of several commercial programs to copy files between Disk BASIC and OS-9 disks. To use rsdos, with a Disk BASIC disk in Drive 1 and an OS-9 disk in Drive 0, you use commands like those in Figure 3 to accomplish the transfer. For more detailed usage, consult the documentation files that accompany rsdos.

Most people find going the OS-9 route considerably more convenient, once it's set up, than using RS2OS9. The catch of course is that you must get the ipatch and rsdos programs and the CC3Disk.ipc file onto an OS-9 disk in order to make the changes and use rsdos. The usual procedure is to get RS2OS9 first, use it to transfer the necessary files to get rsdos working, and use that for future transfers.

The setup for using the OS-9 utilities is unfortunately more complicated than it would be if the standard CC3Disk driver included the needed abilities. But once installed, transferring files between Disk BASIC and OS-9 can be quite routine.

Options, Options

Also available on the information services is Bob Santy's pcdos, which can read and write MS-DOS disks. This program works almost identically, and uses the same patched version of CC3Disk.

There are also several commercial packages available and, especially if you plan on doing a lot of file transfers, you may want to consider one. All of these require D.P. Johnson's *SDisk3* replacement disk driver for Level II, or *SDisk* for use with Level I. Also they all allow you to read, write, and format MS-DOS disks.

Granite Computer Systems' *GCS File Transfer Utilities* support MS-DOS, Disk BASIC, *Flex* and *Mini-Flex* formats, and sport a point-and-click *Multi-Vue* interface for ease of use. Granite Computer Systems also carries *SDisk* and *SDisk3*.

D.P. Johnson's *MSF MS-DOS File Manager* is similar to the one available for OS-9/68000 systems. Once installed in your boot file, *MSF* lets you read and write MS-DOS disks as if they were OS-9 disks. You simply use the standard OS-9 utilities on Drive /ms0 to access an MS-DOS disk in Drive 0, just as you would use those same utilities on /d0 to access an OS-9 disk. D.P. Johnson also has a set of *PC-XFer* utilities that function much like Bob Santy's programs, but include the ability to format an MS-DOS disk.

Being able to transfer files quickly and easily opens up a new world for Disk BASIC and OS-9 users alike. Each system has its own advantages, and each offers software that isn't available for the other. The key to taking advantage of both worlds is all in how you make the move.

To read a directory of a Disk BASIC disk in Drive /d1:

```
rsdos -dir /d1
```

To get a file from a Disk BASIC disk in /d1 and put it on an OS-9 disk in /d0:

```
rsdos -get /d1 RSFILE.EXT /d0/file.ext
```

To put a file from an OS-9 disk onto a Disk BASIC disk:

```
rsdos -put /d1 RSFILE.EXT /d0/file.ext
```

Figure 3: Typical rsdos Usage

Editor's Note

We wanted to give readers a head start in transferring files between Disk BASIC and OS-9, so we called Bob Santy to ask his permission to include rsdos, ipatch *and the other necessary files on RAINBOW ON DISK. In the interest of encouraging the use of OS-9 in the CoCo Community, Mr. Santy graciously agreed to our request. The programs and patch files are located in the* CMDS, DOC *and* PATCHES *directories of this month's disk. If you intend to use the Level II program,* rsdos, *you must still patch the* CC3Disk *module as described in Figure 2 of this article. We were unable to contact the author of* RS2OS9.BAS, *so we cannot provide that program on the disk.*

NEWSPAPER09

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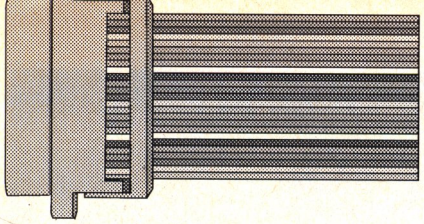

Database Reconstruction

by Eddie Kuns
OS-9 SIG Database Manager

Last month I promised to present the new primary keywords for use in the OS9 Online databases. First, let me explain some of the reconstruction. Figure 1 shows the current list of topics and Figure 2 shows the proposed list of new topics once the reconstruction is finished. The names in Figure 2 aren't the final topic names — the final topic names will be unique in the first three to five characters.

You'll notice that several topics have been deleted: Users Group, Utilities, Patches, Grits & Gravy and 68K-OS9. With the dissolution of the OS-9 Users Group, it doesn't seem sensible to have the entire Users Group library on Delphi in its own topic. Thus, all these groups will be taken off Delphi and the last version of the OS-9 Users Group library will be uploaded slowly into the appropriate topics. The Utilities database has been merged into the Applications database. The patches in the Patches database have been moved to where the item being patched would belong. A patch to `CC3Disk` would be in System Modules (6809); a patch to *OSTerm* would be in Telecom (6809); a patch to *dEd* would be in Applications. This should make patches easier to find and the most recent version of a program easier to figure out. The Grits & Gravy topic was never heavily used and is thus being discarded. The 68K-OS9 topic is being replaced by several topics for OS-9/68000, preparing for the fact that many members of the OS-9 SIG are buying or have bought OS-9/68000 machines.

General Information
Users Group
Applications
Utilities
Device Drivers
Patches
Telcom
Graphics & Music
Programmers Den
Grits & Gravy
68K-OS9
Rainbow OS-9 Material ($)
Tutorials & Education
System Standards
New Uploads

Figure 1: Current Database Topics

The Graphics & Music database is being split into two databases: Games & Graphics and Music & Sound. These databases won't be further split into 6809 and 68000 databases because the sound and graphics files are generally transportable across machines even when the programs to display or play them aren't.

Two databases have been somewhat redefined. Many files have been moved into the Programmer's Den, which now is the home for any files that aid programming. This includes libraries, sample source code, programming utilities (such as `cb` and `lint`), and compilers and interpreters. The System Modules database topics will be the home for all operating system-related files, such as new device drivers, patches to the Kernel, and information about operating system internals. There will be two databases for System Modules: one for the 6809 and one for 68000. Watch the OS-9 SIG Forum for the latest news on the progress of the reorganization.

OS-9 Database Keywords

When you are creating a new group using the `SUBMIT` command, you are asked to enter a primary keyword. Each database topic has a limited number of primary keywords that hopefully will cover all groups ever to be submitted to that topic. So far, only the General Information and Applications databases have new primary keywords.

General Information
Tutorials & Education
Applications (6809)
Telecom (6809)
System Modules (6809)
Games & Graphics
Music & Sound
Programmers Den
Applications (68000)
Telecom (68000)
System Modules (68000)
Rainbow OS-9 Material ($)
Standards
New Uploads

Figure 2: Proposed Database Topics

Here are the new primary keywords for the General Information database:

- Announcements
- Archives
- Humor
- News
- Reviews
- Update

Eddie Kuns is pursuing a PhD in physics at Rutgers University. He lives in Aurora, Illinois, and works as a programmer and researcher at Fermilab. Eddie is co-manager of the CoCo SIG; his username is EDDIEKUNS.

```
From:  BOS1A::JBUCATA
To:    EDDIEKUNS, GREGL, TIMKIENTZLE, BOBKEMPER
Subj:  This isn't a real message
```

Figure 3: Recieved Mail Message Header

Most of these keywords are self-explanatory. The difference between an announcement and news is that news is later information about something that has already been announced. An announcement is the first information in the SIG about a product. Updated documentation and errata sheets would use the the Update keyword.

The new primary keywords for the Applications database (where all applications and utilities have been merged) are

- Archivers
- Database
- Patches
- Productivity
- Text Processing
- Utilities

The meanings of most of these keywords are also self-evident. (Isn't it nice when it works out that way? Thanks, Greg, for the hard work in finding a small set of good keywords.) Productivity applies to utilities and/or applications designed to improve your productivity, including menu systems.

We discovered at the last minute that we are allowed only six primary keywords per topic and were forced to merge several keywords. The Utilities keyword is subdivided with three secondary keywords: Disk, Printer and System. If you want to search for a disk, printer or system utility, search using the keyword Disk, Printer or System instead of Utilities. However, the keywords used in Applications may be changed if we find a better solution, and all changes will be documented in the Forum.

Two Meg Coming Into Vogue?

In the OS-9 SIG Forum this month, there has been a fair amount of discussion by several SIG members who upgraded their CoCo's to two megabytes of memory. While this upgrade isn't for the weak of heart, it works. Details have been uploaded into the databases.

Carbon Copies

There's a new feature in Mail. Now, when you send, reply to or forward mail, you can send a carbon copy of the message to other people. To turn this feature on, use the Mail command `SET CC_PROMPT`. (Turn it off using `SET NOCC_PROMPT`.) This setting lasts until you change it. You can now use the `CC:` prompt just as you would use the `To:` prompt. For example, if I got a message from Jason Bucata that was to me, Greg Law, Tim Kientzle and Bob Kemper, the header would look like the one shown in Figure 3.

```
To:    BOS1A::JBUCATA
Subj:  Re: This isn't a real message
CC:
```

Figure 4: Mail Message Header on Reply

Remember that the `BOS1A::` part simply means computer `1A` at Boston; you can ignore this part of the Mail address. If I now type `REPLY`, assuming I've turned on `CC_PROMPT`, I will see the header shown in Figure 4 with the cursor waiting after the `CC:` prompt. If I now type

```
CC: GREGL, TIMKIENTZLE, BOBKEMPE
R, EDDIEKUNS
```

four carbon copies of the message will be sent, one to myself.

May Uploads

Paul Seniura contributed an essay describing many of the common grammar mistakes he notices in Forum messages and program documentation. If you are concerned about your grammar, you may want to read this short essay. **Greg Law** posted a Forum message describing the new standards we're trying to establish in the OS-9 SIG databases. **Paul Ward** and **Ed Gresick** uploaded more information about their new OS-9/68000 computers.

Jerry Stratton's *Corner Clock* displays and updates the current time in the corner of the window you run it in; his *Optstart* allows a Shell script (particularly the `startup` Shell script) to perform one of several different commands, with the choice based on which keys are being pressed. **Philip Brown** posted the binary executable for `tar`, a commonly used archiving program; Ed Gresick previously contributed the source and documentation. **Brian White** released `SPEEDISK VERSION 0.21`. This useful utility defragments your disk as well as performs disk checking. The current version works only on small disks. **Brother Jeremy** uploaded *MVWord*, the beginning of a WYSIWYG editor; an OS-9 analog to *MAX-10*.

Paul Jerkatis posted **Bruce Isted**'s `SACIA` RS-232 driver, which is a replacement for `ACIAPAK`. (This driver is also included in Bruce's earlier upload, `ELIMINATOR SOFTWARE AND MANUAL`.) **Marie-Louis Marcoux** released her patch to Burke & Burke's hard-disk drivers to allow you to partition your hard drive into multiple drives. **Randy Wilson** uploaded the latest version of *Supercomm*, which fixes some bugs from earlier versions and supports ZModem. **John Farrar** contributed his new `TRXMon`. This program acts like `TSMon` (it monitors a serial line, waiting for an incoming call) except that it detects the speed of the incoming call before forking `Login`.

Philip Brown uploaded a sample pro-

OS-9 Budget System

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gram demonstrating how to use Bruce Isted's VRN virtual-memory driver as well as a file explaining how to use subroutine modules. **Brian McCuskee** released *CCTools*, an application patterned after the popular *PC Tools*

In the CoCo SIG, **Joe Sannucci** uploaded a file that has made the rounds on the networks. This file explains in detail why suicide shouldn't be an option. He also contributed two useful disk utilities, one that shows the files on a disk and the amount of free space, and another by **Roger Taylor** that gives the COPY command wildcards. **Marty Goodman** posted a forum message by **Art Flexser** describing how to customize the setup for *Extended ADOS-3*. Marty also uploaded two text files describing Multi-Pak repairs. One explains why all Multi-Paks must be upgraded for CoCo 3 use and the other details his repair of a dead Multi-Pak.

Don Vaillancourt contributed several arcade games called *Wizard*, *Space Hawk* and *Moon*. **Johnny Williams** released Version 1.1 of *Super Trivia* with the trivia titled Pseudonyms. **Danny Fye** uploaded answers to this trivia. **Matthew Thompson**, the author of *Bells & Whistles 2*, released 19 songs from his music library. Marty Goodman posted a product announcement by the author of *CCTools*, a product similar to *PC Tools*. ❑

Database Report

OS-9 SIG

General Information

COMMON MISTAKES IN ENGLISH	
PAULSENIURA	Paul Seniura
NEW 68XXX NEWSLETTER	
EDELMAR	Ed Gresick
DATABASE UPDATE AND STANDARDS	
GREGL	Greg Law
MM/1 C GRAPHICS LIBRARIES	
PKW	Paul K. Ward

Applications

PERUSE V1.0: FILE VIEWER	
STEPHENC	Stephen Castello
3D GRAPHICS PLOTTER	
DONTHRASH	Donald Thrash
VDG SCREEN CREATOR	
KMTHOMPSON	Kelly Thompson
GSORT REPLACEMENT	
WOAY	Jim Martin
CORNER CLOCK	
CAPVIDEO	Jerry Stratton
OPTSTART: OPTIONAL STARTUP	
CAPVIDEO	Jerry Stratton
ALTER BYTES IN A FILE	
CAPVIDEO	Jerry Stratton
TAR EXECUTABLE	
THEFERRET	Philip Brown
POINT-AND-SHOOT MENU	
SEBJMB	Jeff Blower
SPEEDISK V0.21	
BRIANWHITE	Brian White
WORD WRAP TEXT FILES	
RZAKER	Bob Zaker
MVWORD (WYSIWYG EDITOR)	
REVWCP	Brother Jeremy
INDEX DISK FILES	
RZAKER	Bob Zaker

Device Drivers

REPLACEMENT FOR ACIAPAK	
MITHELEN	Paul Jerkatis
B&B HARD DISK PARTITION	
MARLOU	Marie-Louis Marcoux

Telcom

SUPERCOMM VERSION 2.1A	
RANDYKWILSON	Randy Wilson
RIBBS 2.0 STUFF	
WESGALE	Wes Gale
TRXMON TEST VERSION	
TRIX	John Farrar

Graphics & Music

MFF10: HANDLES LARGER MFF1 FILES	
PAULSENIURA	Paul Seniura
THE LEGEND	
BOBKEMPER	Robert Kemper
3 PLAYBOY PLAYMATES MACPIX	
GRAPHICSPUB	Bob Montowski
3 PIX OF PLAYMATE RENEE TENISON	
GRAPHICSPUB	Bob Montowski
PLOT QUADRATIC EQUATIONS	
MIKEHAN	Mike Hanewinckel
IVES'S FOURTH SYMPHONY	
DMACIAS	David Macias
MAGIC STONES GAME	
RESLER	Floyd Resler
RESCUE THE COLONISTS!	
RESLER	Floyd Resler
THE DUNGEON DEPTHS	
RESLER	Floyd Resler
LIFECALL ADVERTISEMENT SOUNDS	
KENCARLIN	Ken Carlin

Programmers Den

TEXT-SCREEN MOUSE CURSOR	
THEFERRET	Philip Brown
CC2 PATCH	
WESGALE	Wes Gale
GFX3 AND DOC	
MIKEHAN	Mike Hanewinckel
C MEMORY MAPPING LIBRARY	
DONTHRASH	Donald Thrash
VRN ALLOCATION DEMO	
THEFERRET	Philip Brown
SUBROUTINE MODULES & HOW TO USE	
THEFERRET	Philip Brown
CTAGS - INDEX C SOURCE FILES	
THEFERRET	Philip Brown
CCTOOLS	
BEMCCUSKEE	Brian McCuskee
SAVE AND RESTORE WINDOW INFO	
ZACKSESSIONS	Zack Sessions

COCO SIG

General Information

SUICIDE? YOU GOTTA BE KIDDING!	
SANNUCCI	Joe Sannucci

CoCo 3 Graphics

SUPERMAC	
SANNUCCI	Joe Sannucci
PAULA ABDUL PORTRAIT	
SANNUCCI	Joe Sannucci
KEEBLER'S NO.1 ELF	
HOWARDC	Howard C. Rouse
GRAVE2.CM3	
HOWARDC	Howard C. Rouse
MATADOR & TORO THE BULL	
HOWARDC	Howard C. Rouse
HUMMING-BIRDS	
HOWARDC	Howard C. Rouse
GREAT PLAYMATE SEARCH	
LDMOORE	Larry Moore
NIB NUBILES #5 (19 PICS)	
STEVEPDX	Steve Ricketts
NIB NUBILES #3 (16 PICS)	
STEVEPDX	Steve Ricketts
NIB NUBILES #4 (22 PICS)	
STEVEPDX	Steve Ricketts
THE PROJECTOR	
SAGAN	John McCaffrey
NIB NUBILES #1 (17 PICS)	
STEVEPDX	Steve Ricketts
NIB NUBILES #2 (18 PICS)	
STEVEPDX	Steve Ricketts

Utilities & Applications

DISK DIRECTORY-FREE GRANS VIEWER	
SANNUCCI	Joe Sannucci
WILDCOPY	
SANNUCCI	Joe Sannucci
CHECKBOOK FOR COMPOSIT MONITORS	
COCKYFS	Fred Swygert
HIGHLIGHT FIX 4 ADOS3	
MARTYGOODMAN	Marty Goodman

Hardware Hacking

WHY THE MULTIPAK MUST BE UPGRADE	
MARTYGOODMAN	Marty Goodman
A REPAIR OF A MULTIPAK	
MARTYGOODMAN	Marty Goodman

Games

ANSWERS FOR SUPER TRIVIA 1.1	
DFYE	Danny Fye
HI-RES CHESS BOARD SIMULATOR	
DRILLMASTER	Johnny Williams
ARCADE PACK	
DONVAIL	Don Vaillancourt
SUPER TRIVIA 1.1	
DRILLMASTER	Johnny Williams

Music & Sound

BOB'S ASSORTED LYRA MUSIC	
BAWILLIAMS	Bob Williams
19 BW2 SONGS	
MATHOMPSON	Matthew Thompson

Product Reviews & Announcement

COCO TOOLS FROM CER COMP	
MARTYGOODMAN	Marty Goodman

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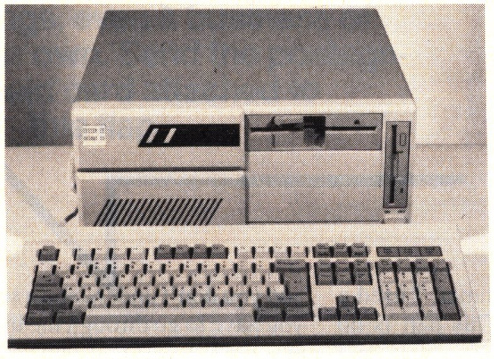

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FLEXELINT V4.00 - C Source Code Checker $495.00
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DISASM_OS-9 - OS-9/68K Disassembler $250.00
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WINDOWS - C Source Code Windowing Library $250.00
This C source code library package supports multiple overlapping windows displayed on one character-based terminal screen. It supports window headers and footers, and pop-up windows. Windows may be moved, panned, written to while off-screen, etc..

PROFILE - User State Program Profiler $270.00
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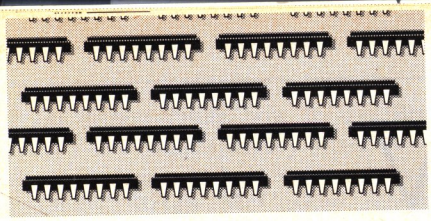

Turn of the Screw

EPROM Programmer, Too

by Tony DiStefano
Contributing Editor

I started a four-part series on building an EPROM programmer in the August 1990 issue of THE RAINBOW. This programmer was originally a Disto product I introduced in early 1985.

When I designed hardware back then, I didn't have the fancy CAD (Computer-Assisted Design) software and hardware I now use to design things. Back then, everything was done by hand, on sheets of paper. When I transferred all my work on the EPROM programmer from my scribbled notes to articles for THE RAINBOW, some errors crept in. When you work with Hi-Tech toys, it is very easy to create CAE (Computer-Assisted Errors).

A reader from Texas was kind enough to make note of these errors and tell me about them. He was able to get the EPROM programmer working, but I feel I should pass the information along to you in case you tried to get the EPROM programmer working and got stuck. Another reader wrote asking if he could have a copy of the assembly-language source code so he could make changes to the EPROM programmer software. Other readers also indicated their interest in programming EPROMs with larger capacity. Let's take a look at each these three topics.

Corrections

Here are the corrections to the EPROM programmer series. The first has to do with U8, the V_{PP} voltage regulator. This problem stemmed from using a replacement part. In the original EPROM programmer, I used a 78GUIC voltage regulator. This part is no longer available so I used the LM317 as a replacement, but the LM317 is not completely compatible with the 78GUIC. Remove R4, R5, R9 and JP2. Add a 220-ohm resistor from Pin 1 to Pin 2 of U8. Add a 3.3K-ohm resistor from Pin 1 of U8 to Ground. This gives you 21 volts. Add a 100K-ohm resistor from Pin 1 of U8 to the first pin of a 2-pin jumper. Add a wire from the second pin of the jumper to Ground. When the jumper is installed, the output voltage should be 12.5 volts.

The last word of the second sentence of the fourth paragraph of the second column on Page 68 of the September 1990 issue should be Low. The last word of the sixth sentence of the same paragraph should be High. In the sixth sentence of the third paragraph of the same page, the word Low should be High and the word High should say Low. Finally, the inputs and outputs of U1 have been drawn in reverse. To correct this, you have to swap eight pairs of wires. Swap pins 2 and 18, 4 and 16, 6 and 14, 8 and 12, 11 and 9, 13 and 7, 15 and 5, and finally 17 and 3. With these alterations, the EPROM programmer should work properly.

Source Code

Listing 1 shows the assembly-language source code I used to run the EPROM programmer. To assemble this into an executable program, I used the *Macro-80C* assembler from Micro Works. Other assemblers may work as well, but you may have to make minor changes to the source code. The source code also has comments, which are essential to understanding the inner workings of the program. Everyone has different ways of commenting source code.

If you plan to change the source code and you don't understand a section of code, you have to go through the instructions one at a time. I find that you must know your computer hardware very well before you play with source code that controls hardware. I am including the source code for those of you that understand hardware and software very well and may want to change things around or play with larger capacity EPROMs. But, be careful in what you do. Remember, when dealing with hardware, it is very easy to burn something out, including your computer.

Modifications

The following ideas about programming larger EPROMs are only theories and guidelines. In order to make this work, you must do more detailed work and prototypes. This is not a complete and tested project.

Figure 1 shows four large EPROMs. Each one has double the capacity of the previous. The first, a 27256, is a 32K EPROM. The others are 64K, 128K and 256K, respectively. I know there is another EPROM on the market already that has a capacity of 512K. The part number is 27040 but I could not find a diagram for it. My guess is that the *PGM pin becomes A18.

The first EPROM (the 27256) is in a 28-pin package. It already works in our programmer. I put it on this list to make pin comparisons. The second is also in a 28-pin package. As you can see, the only difference between the two is Pin 1. What was V_{PP} is now A15 and V_{PP} is moved to Pin 22. This technique has been used before. Remember the 24-pin, 8K EPROM by Motorola? It used *CE as V_{PP}.

The 27010 and 27020 EPROMs are slightly larger packages. There are 32 pins on these parts. The extra pins are used for more address control lines. Things seem to repeat themselves. The 27010 and the 27020 have

---

Tony DiStefano is a well-known early specialist in computer hardware projects. He lives in Laval Ouest, Quebec. Tony's username on Delphi is DISTO.

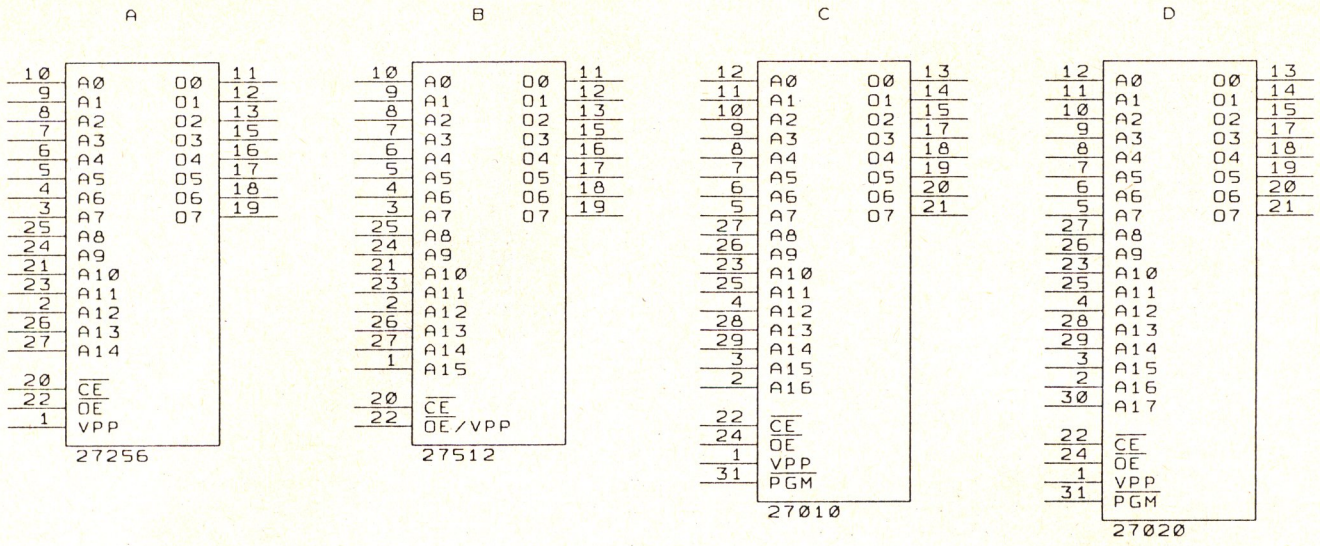

Figure 1

the same control signals as the 27128. Namely, *CE, *OE, V_{PP} and *PGM. The only logical difference is the number of address lines. The physical difference is the number of pins per package. So, in theory, the only difference to program the 27010 is that it is larger (in the number of memory bytes it has). All the waveforms will be the same. To someone who wanted to program these larger EPROMs, here are the changes to consider.

The first problem to overcome is the bigger EPROM socket. You need a 32-pin socket. If you look carefully, starting from Pin 5 of the 27010 and Pin 3 of the 27128, all the signals are the same almost all the way around. Only minor changes are needed. Wiring the balance of the signals requires that you match the signals from one socket to the other. The next problem is the extra address lines. You will need another latch to add the extra lines. This means using another 74LS138 and another 74LS273. Use the other half of A2 to memory-map the extra locations.

The final problem you have to deal with is software. You need to edit the EPROM programmer software to consider the extra address lines and the extra memory required to load and save the extra data required to fully program a 27010. Remember, it is a 128K EPROM. If you only have a CoCo 1 or 2, you need to transfer data in small blocks. If you have a CoCo 3 with 512K, you have to learn how the memory paging works.

Now, when all is said and done, some EPROM manufacturers state that the 27010 and 27020 have the option to be programmed using a quick-pulse method. This can save much time in programming. This method is different than the one I use. An EPROM data manual will describe how it is done.

I leave it up to you to design the circuit and the support software. Good luck in programming bigger EPROMs. ❑

32K Disk

The Listing: EPROM.ASM

```
* THIS IS A DISTO EPROM
* PROGRAMER.
* LAST VERSION MAY 06 90
* LAST CHANGE FOR CMOS EPROMS

CLS     EQU     $A928
CONTRL  EQU     $FF51
DELAY   EQU     $006F
DSTART  EQU     $3000
CURPOS  EQU     $88
LENGTH  EQU     $380
X       EQU     $382
ERRFLG  EQU     $383
PADD    EQU     $384
DEND    EQU     $386
TEMP    EQU     $388
IDENT   EQU     $389
INBUF   EQU     $2DD
LINEIN  EQU     $A390

START   CLR     $FF40
        ORCC    #$50            MASK INT.
ST1     JSR     CLS
        LEAX    TITLE,PCR
        LBSR    OUTLIN
        LDU     #CONTRL
        LBSR    GETCHR
        STA     IDENT
        CMPA    #'1
        BEQ     ST2
        CMPA    #'2
        BEQ     ST4
        CMPA    #'3
        BEQ     ST4
        CMPA    #'4
        BNE     ST1
ST4     LDD     #$4000
        BRA     ST3
ST2     LDD     #$2000
ST3     STD     LENGTH
        ADDD    #DSTART
        STD     DEND

WAR1    LBSR    PPAGE           PRINT TITLE PAGE

WARM    LDY     #0              CLEAR ADDRESS
        CLR     0,U             SHUT DOWN EPROM
        CLR     2,U             ZERO STEPPER
```

```
        CLR     ERRFLG
SOUND   CLRB
        LDA     #$DØ
        STA     $8C
        LDX     #ØØ
        STX     $8D
SO1     JSR     $A962           MAKE SOUND
        INCB
        BNE     SO1
WA1     LDX     #$54A
        STX     CURPOS
WA2     LBSR    GETCHR
        CMPA    #'Ø
        BGT     WA3
        BRA     WA2
WA3     CMPA    #'6
        BGT     WA2
        JSR     [$AØØ2]
        PSHS    A,X
        LEAX    BLANK,PCR
        LBSR    STATL
        PULS    A,X
        CMPA    #'1
        BEQ     ERASED
        CMPA    #'2
        LBEQ    PROG
        CMPA    #'3
        LBEQ    VERIFY
        CMPA    #'4
        LBEQ    MOVE
        CMPA    #'5
        BEQ     FINI
        CMPA    #'6
        LBEQ    EXAM
        BEQ     WA1

FINI    LBRA    $AØ27           END OF LINE!

ERASED  LEAX    CHECK,PCR       MESSAGE
        LBSR    STATL           PRINT
        LDX     #DSTART         START OF MEM
        LBSR    ONREAD
        LDA     #$FF
ER1     CMPX    DEND
        LBEQ    POK             PRINT OK AND WARM
        CMPA    -1,U
        BEQ     ER2
        LEAX    1,X
        LBSR    ERROR
        LEAX    -1,X
ER2     LBSR    INCADD
        LEAX    1,X
        BRA     ER1

MOVE    LEAX    TRANS,PCR
        LBSR    STATL
        LDX     #DSTART
        LBSR    ONREAD
MO1     LDA     -1,U            EPROM DATA
        STA     ,X+             IN MEMORY
        CMPX    DEND
        BEQ     MO4
        LBSR    INCADD
        BRA     MO1
MO4     LBRA    POK

EXAM    LEAX    EXMEG,PCR
        LBSR    STATL
        LDB     #4              4 CHARACTERS
A@      LBSR    LINEIN
        LBCS    BREAK
        LDX     #INBUF
        LBSR    GNUM
E@      LDA     #$D
        JSR     [$AØØ2]
        TFR     X,D
        LBSR    HEXASC
        TFR     B,A
        LBSR    HEXASC
        LDA     #$2Ø
        JSR     [$AØØ2]
        LDA     ,X
        LBSR    HEXASC
        LDA     #$2Ø
        JSR     [$AØØ2]
        CLR     TEMP
F@      LBSR    GETCHR
        CMPA    #94             UP ARROW
        BEQ     B@
        CMPA    #1Ø             DOWN ARROW
        BEQ     C@
        CMPA    #$D
        LBEQ    WAR1
        CMPA    #'Ø
        BLO     F@
        CMPA    #'9
        BLS     Q@
        CMPA    #'A
        BLO     F@
        CMPA    #'F
        BHI     F@
Q@      STA     INBUF           FIRST DIGIT
        JSR     [$AØØ2]
R@      LBSR    GETCHR          SECOND DIGIT
        CMPA    #'Ø
        BLO     R@
        CMPA    #'9
        BLS     S@
        CMPA    #'A
        BLO     R@
        CMPA    #'F
        BHI     R@
S@      STA     INBUF+1
        JSR     [$AØØ2]
        CLR     INBUF+2
        PSHS    X
        LDX     #INBUF
        LBSR    GNUM
        TFR     X,D
        TFR     B,A
        PULS    X
        STA     ,X+
        LBRA    E@
B@      LEAX    -1,X
        LBRA    E@
C@      LEAX    1,X
        LBRA    E@

* This is the routine to program
* the EPROM.
* It starts up by;
* A12 & A13 TO Ø
* VCC ON (HI)
* VPP OFF (LO)
* PGM & OE DISABLED (HI)
* WDE INABLED (HI)
* CE INABLED (LO)

PROG    LDA     IDENT
        CMPA    #'2
        LBGT    PROGS
        LEAX    PEPROM,PCR
        LBSR    STATL
        LDX     #DSTART
        LDB     #%11001100      START UP
        STB     ,U
        LDA     ,X+             FIRST BYTE
        STA     -1,U            TO EPROM
        ORB     #$2Ø            VPP ON
        STB     ,U
PGM1    CLR     X               COUNTER PROG LOOP
PGM2    LDA     #1
        LBSR    PAMS            BURN FOR 1 ms.
        INC     X
```

```
        LDA     X
        CMPA    #15
        BEQ     LBURN

        ANDB    #%01111011      READ MODE
        STB     ,U
        LDA     -1,U            GET DATA
        ORB     #%10000100      WRITE MODE
        STB     ,U
        CMPA    -1,X            PROGRAM?
        BNE     PGM2            NO ANOTHER SHOT

LBURN   LDA     X
        ASLA                    MULTIPLY BY 4
        ASLA
        LBSR    PAMS            BURN A MS
        PSHS    D,X
        STX     PADD
        LDX     CURPOS
        LBSR    OUTADD
        LDA     #$20
        JSR     [$A002]
        LDA     X
        LDB     #5
        MUL
        TFR     B,A
        LBSR    HEXASC
        STX     CURPOS
        PULS    D,X
        LDA     X
        CMPA    #15
        BNE     LADDR

        ANDB    #%01111011      READ MODE
        STB     ,U
        LDA     -1,U            GET DATA
        ORB     #%10000100      WRITE MODE
        STB     ,U
        CMPA    -1,X
        LBNE    FAILED

LADDR   CMPX    DEND
        LBEQ    POFF            FINISHED
        LBSR    INCADD          NEXT EPROM ADD
        LDA     ,X+             GET NEXT DATA BYTE
        STA     -1,U
        LBSR    BREAK           CHECK BREAK KEY
        BRA     PGM1            BURN AGAIN


*THIS IS THE ROUTINE TO PROGRAME
*THE 27256 BOTH HIGH AND LOW

PROGS   LEAX    PEPROM,PCR
        LBSR    STATL
        LDX     #DSTART
        LDA     IDENT
        CMPA    #'3
        BEQ     PR1
        LDB     #%11011100      START UP 2/2
        BRA     PR2
PR1     LDB     #%11010100      START UP 1/2
PR2     STB     ,U
        LDA     ,X+             FIRST BYTE
        STA     -1,U            TO EPROM
        ORB     #$20            VPP ON
        STB     ,U
PGM1S   CLR     X               COUNTER PROG LOOP
PGM2S   LDA     #1
        LBSR    PAMSS           BURN FOR 1 ms.
        INC     X
        LDA     X
        CMPA    #15
        BEQ     LBURNS

        ANDB    #%01111011      READ MODE
        STB     ,U
        LDA     -1,U            GET DATA
        ORB     #%10000100      WRITE MODE
        STB     ,U
        CMPA    -1,X            PROGRAM?
        BNE     PGM2S           NO ANOTHER SHOT

LBURNS  LDA     X
        ASLA                    MULTIPLY BY 4
        ASLA
        LBSR    PAMSS           BURN A MS
        PSHS    D,X
        STX     PADD
        LDX     CURPOS
        LBSR    OUTADD
        LDA     #$20
        JSR     [$A002]
        LDA     X
        LDB     #5
        MUL
        TFR     B,A
        LBSR    HEXASC
        STX     CURPOS
        PULS    D,X
        LDA     X
        CMPA    #15
        BNE     LADDRS

        ANDB    #%01111011      READ MODE
        STB     ,U
        LDA     -1,U            GET DATA
        ORB     #%10000100      WRITE MODE
        STB     ,U
        CMPA    -1,X
        LBNE    FAILED

LADDRS  CMPX    DEND
```


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```
        BEQ     POFF            FINISHED
        LBSR    INCADD          NEXT EPROM ADD
        LDA     ,X+             GET NEXT DATA BYTE
        STA     -1,U
        LBSR    BREAK           CHECK BREAK KEY
        BRA     PGM1S           BURN AGAIN

* POWER DOWN WITHOUT FALSE
* BURN OF CMOS DEVICES

POFF    LDA     #$FF            (NO ERASING)
        STA     -1,U            STORE DATA
        ANDB    #%11011111      TURN VPP OFF
        STB     ,U              DO IT
        LBRA    POK             FINISHED BURN

* This routine verifies EPROM.

VERIFY  LEAX    VEPROM,PCR
        LBSR    STATL
        LDX     #DSTART
        LBSR    ONREAD
VER1    LDA     ,X+             MEMORY DATA
        CMPA    -1,U            EPROM DATA
        BEQ     VER2
        LBSR    ERROR
VER2    CMPX    DEND
        BEQ     VEREND
        LBSR    INCADD
        BRA     VER1
VEREND  LBRA    POK

* START OF ROUTINES

INCADD  LEAY    1,Y             INC STEPPER
        CMPY    #$1000
        BNE     INC1
        LDY     #0              CLEAR STEPPER
        INCB                    NEXT ADDRESS BLOCK
        STB     ,U
INC1    CLR     1,U             STEP INC ADDRESS
        RTS

PAMS    PSHS    X
        ANDB    #%11110111
        STB     ,U              PGM ON (LOW)
PA2     LDX     #DELAY          3 CYCLES
PA1     LEAX    -1,X            8 CYCLES
        BNE     PA1             PER LOOP
        DEC     A               2 CYCLES
        BNE     PA2             3 CYCLES
        ORB     #%0001000
        STB     ,U              PGM OFF (HI)
        PULS    X,PC

PAMSS   PSHS    X
        ANDB    #%11101111
        STB     ,U              CE ON (LOW)
PA2S    LDX     #DELAY          3 CYCLES
PA1S    LEAX    -1,X            8 CYCLES
        BNE     PA1S            PER LOOP
        DEC     A               2 CYCLES
        BNE     PA2S            3 CYCLES
        ORB     #%00010000
        STB     ,U              PGM OFF (HI)
        PULS    X,PC

FAILED  CLR     2,U             STEPPER
        CLR     ,U              SHUT DOWN EPROM
        STX     PADD
        LEAX    PFAIL,PCR
        LBSR    STATL
        LBSR    OUTADD
        LBRA    WARM

STATL   PSHS    X               STATUS LINE
        LDX     #(13*32)+3+1024
        STX     CURPOS
        PULS    X
OUTLIN  PSHS    A,X
OUT1    LDA     ,X+
        CMPA    #4              END OF LINE
        BEQ     OUTEND
        JSR     [$A002]         PRINT CHAR
        BRA     OUT1
OUTEND  PULS    A,X,PC

PPAGE   PSHS    A,X,Y
        JSR     CLS
        LEAX    SEL,PCR
        BSR     OUTLIN
        LDA     IDENT
        CMPA    #'1
        BEQ     P1
        CMPA    #'2
        BEQ     P2
        CMPA    #'3
        BEQ     P3
        LEAX    E2562,PCR
        BRA     PF
P1      LEAX    E64,PCR
        BRA     PF
P2      LEAX    E128,PCR
        BRA     PF
P3      LEAX    E2561,PCR
PF      BSR     OUTLIN
        LEAX    PAGE,PCR
        BSR     OUTLIN
        PULS    A,X,Y,PC

GETCHR  PSHS    B,X
GET1    JSR     [$A000]
        BNE     GET3
        DEC     $94             BLINK DELAY
        BNE     GET5            NOT TIME
        LDB     #11
        STB     $94             RESET COUNTER
        LDX     CURPOS          GET POSITION
        LDA     ,X              GET CHAR
        ADDA    #$10            NEXT COLOR
        ORA     #$8F            SOLID COLOR
        STA     ,X              TO SCREEN
GET5    LDX     #$045E
        JSR     $A7D3           WAIT LOOP
        BRA     GET1
GET3    LDB     #$20
        STB     [CURPOS]
        PULS    B,X,PC

* ERROR PRINTS OUT 2 VALUES
* FIRST IS IN A REG
* SECOND IS POINTED TO BY U REG

ERROR   STB     ERRFLG
        PSHS    D,X
        STX     PADD
        LEAX    AT,PCR
        LBSR    STATL
        LBSR    OUTADD
        LEAX    EXP,PCR
        LBSR    OUTLIN
        LBSR    HEXASC
        LEAX    FOU,PCR
        LBSR    OUTLIN
        LDA     -1,U
        LBSR    HEXASC
        LBSR    BREAK           CHECK FOR BREAK KEY
        PULS    D,X,PC

OUTADD  PSHS    D,X
        LDX     PADD
        LEAX    -1,X
        TFR     X,D
        SUBD    #DSTART
```

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GA7 - Connect 4, F-16, Pizza, Rubic, Life +
GA8 - Football, Germ Attack, Othello, Slither, +
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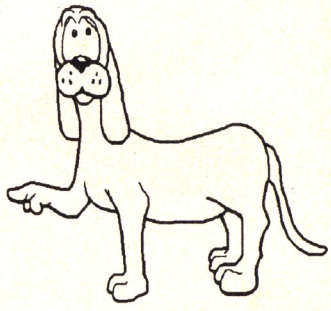

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5	20	35	50	65	80	95	
6	21	36	51	66	81	96	
7	22	37	52	67	82	97	
8	23	38	53	68	83	98	
9	24	39	54	69	84	99	
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M1	GR1	E1	U1	GA1
M2	GR2	E2	U2	GA2
M3	GR3	E3	U3	GA3
M4	GR4	E4	U4	GA4
M5	GR5		U5	GA5
M6	GR6	H1	U6	GA6
M7	GR7	H2	U7	GA7
	GR8	H3	U8	GA8
A1	GR9	H4		GA9
A2	GR10			GA10
	GR11			GA11
T1	GR12			
T2	GR13			
T3	GR14			

Name _____
Address _____
City _____ State ____ Zip _____
Credit Card # _____
Expiration _____ Total $ _____

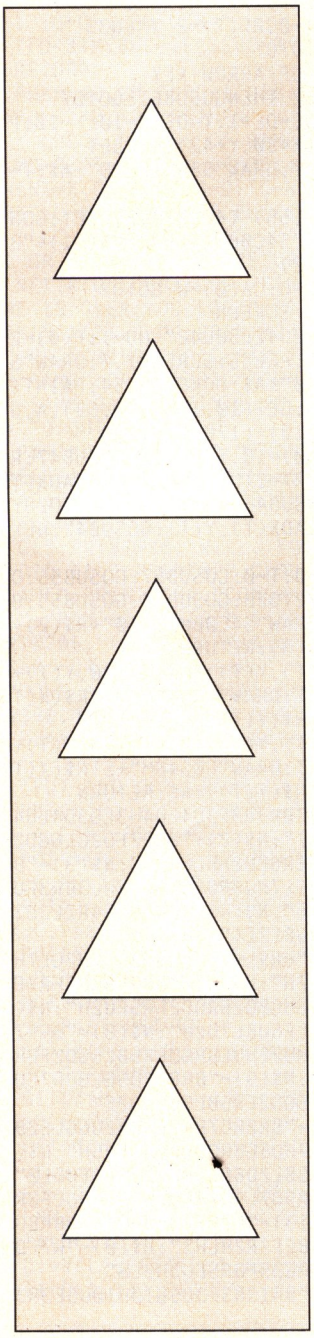
Please Circle : TAPE or DISK

```
        STD     PADD
        LBSR    HEXASC
        LDA     PADD+1
        LBSR    HEXASC
        PULS    D,X,PC

BREAK   JSR     [$A000]
        CMPA    #$03
        BNE     BR3
        LEAS    4,S
        LDA     #$FF            (NO ERASING)
        STA     1,U
        ANDB    #%11011111      VPP OFF
        STB     ,U              DO IT
        LBRA    WARM
BR3     CMPA    #$20
        BNE     BR2
BR1     JSR     [$A000]
        CMPA    #$20
        BNE     BR1
BR2     RTS

* OUTPUTS TO DEVICE 2 HEX CHARS
* FROM A REG ALL PRESERVED

HEXASC  PSHS    A
        LSRA
        LSRA
        LSRA
        LSRA
        CMPA    #10
        BLO     OU1
        ADDA    #$37
        BRA     OU2
OU1     ADDA    #$30
OU2     JSR     [$A002]
        LDA     ,S
        ANDA    #$F
        CMPA    #10
        BLO     OU3
        ADDA    #$37
        BRA     OU4
OU3     ADDA    #$30
OU4     JSR     [$A002]
        PULS    A,PC

ONREAD  CLR     2,U             ZERO STEPPER
        LDA     IDENT
        CMPA    #'3
        BNE     ON1
        LDB     #%01000000      27256 1/2
        BRA     ON2
ON1     LDB     #%01001000
ON2     STB     ,U              EPROM READ MODE
        PSHS    X
        LDX     #0
A@      LEAX    -1,X
        BNE     A@
        PULS    X
        RTS

POK     TST     ERRFLG
        BNE     PO1
        LEAX    OK,PCR
        LBSR    OUTLIN
PO1     LBRA    WARM

* GETS ASCII POINTED BY X
* AND PUTS HEX IN D

GNUM    LDD     #0
        PSHS    D               INIT TOTAL
GNUM2   LDA     ,X+             GET CHAR
        CMPA    #'0
        BLO     GNUM3
        CMPA    #'9
        BLS     GNUM4
        CMPA    #'A
        BLO     GNUM3
        CMPA    #'F
        BHI     GNUM3
        SUBA    #7
GNUM4   SUBA    #'0             MAKE NUMERIC
        ASL     1,S
        ROL     0,S
        ASL     1,S
        ROL     0,S
        ASL     1,S
        ROL     0,S
        ASL     1,S
        ROL     0,S
        ADDA    1,S
        STA     1,S
        BRA     GNUM2
GNUM3   TSTA
        PULS    X,PC

TEXT

TITLE   FDB     $0D0D
        FCC     "  THE DISTO EPROM PROGRAMMER",$0D
        FCC     "       BY TONY DISTEFANO",$0D
        FCC     "            V 1.3",$D
        FDB     $0D0D
        FCC     "        1 - 2764",$0D
        FCC     "        2 - 27128",$0D
        FCC     "        3 - 27256 1/2",$0D
        FCC     "        4 - 27256 2/2",$0D
        FDB     $0D0D
        FCC     " CHOOSE 1, 2, 3 OR 4? ",4

PFAIL   FCC     "EPROM NOT PROGRAMMED PROPERLY    AT
        ADDRESS: ",4

PAGE    FCB     $0D
        FCC     "  1-EPROM ERASED ?",$0D
        FCC     "  2-PROGRAM EPROM.",$0D
        FCC     "  3-VERIFY EPROM.",$0D
        FCC     "  4-READ EPROM.",$0D
        FCC     "  5-RETURN TO BASIC",$0D
        FCC     "  6-EXAMINE/CHANGE MEMORY",$0D
        FDB     $0D0D
        FCC     "COMMAND: "
        FDB     $0D0D
        FCC     "STATUS:",$0D
        FCB     4

SEL     FCC     "  EPROM SELECTED IS A ",4

E64     FCC     "2764",$0D
        FCB     4
E128    FCC     "27128",$0D
        FCB     4
E2561   FCC     "27256 1/2",$0D
        FCB     4
E2562   FCC     "27256 2/2",$0D
        FCB     4

AT      FCC     "AT ",4
EXP     FCC     " EXPECTED ",4
FOU     FCC     " FOUND ",4

OK      FCC     " - OK!",$0D
        FCB     4

BLANK   FCB     55[$20]
        FCB     4
CHECK   FCC     "CHECKING FOR FF'S",4
TRANS   FCC     "MOVING EPROM TO MEMORY",4
VEPROM  FCC     "VERIFING EPROM",4
PEPROM  FCC     "PROGRAMMING ADDRESS: ",4
EXMEG   FCC     "START ADDRESS? ",4

        END
```

An odds-on favorite with Solitaire

Pyramid 2

by George Quellhorst



After the article about the CoCo 3 version of *Pyramid* (May 1991, Page 78), I received many requests for a CoCo 1 and 2 version of the program. To please as many people as possible, I wrote a version of *Pyramid* that uses the PMODE4 screen and works fine on the CoCo 1 and 2. If you are entering this program from the listing in the magazine, pay particularly close attention to Line 55. The two commas after the PAINT statement are necessary for the program to work properly.

When running the program, if the hearts and diamonds on the cards appear blue instead of red and the backs of the cards are red, press the Reset button and run the program again. You may have to repeat this process three, or more, times. The problem is due to the way artifact colors are displayed on the TV screen, and it cannot be corrected with software.

Pyramid is an addictive, easy-to-play Solitaire game. Seven rows of cards are displayed on the screen at the beginning of the game. The first six rows are displayed face down and the last row is displayed face up. The first row contains one card, the second row has two cards, the third row has three cards, etc. A total of 28 cards are displayed on the screen, while 24 cards remain in the deck. The deck is displayed in the upper-left corner of the screen. The top card in the deck is displayed face up.

△△△△△△△△△△△△△△△△△△△△

George Quellhorst has been a CoCo user since the days of 4K. He has two CoCo 2s and a CoCo 3 with an RGB monitor. He enjoys writing programs with his computer equipment. You may contact him by writing to 63 South State St., Apt. 10, Painesville, OH 44077 or by calling (216) 354-3812. Please include an SASE when requesting a reply.

Playing the Game

The object of the game is to move all cards in the pyramid to the deck. The game has been successfully completed when the last card, the top of the pyramid, has been placed on the deck. A card may be moved onto the deck when its value is one greater or one lower than that of the top card in the deck, regardless of the color or suit of the card being moved. For example, a five can be placed on top of either a four or a six; an Ace can be placed on top of a King or a two; and so on.

The program does not allow you to make illegal moves. If you attempt an illegal move, an error beep sounds and the last key pressed is ignored by the computer. A card moved to the deck becomes the new top card until another card is moved up or until you "turn over" the next card in the deck. When a legal move is not available, you must press the up-arrow key to "turn over" the next card in the deck. If the next card does not provide you with a legal move, you must continue "turning over" cards until a legal move becomes available.

When all 24 cards have been used and there are still cards in the pyramid with no legal moves remaining, the game has reached an unsuccessful completion. A successful completion of the game involves moving all 28 cards to the deck before running out of cards in the deck.

Manipulating the Cursor

The cursor appears as a blinking border around the card being put into play. The cards in the pyramid are numbered (for programming purposes) from 1 to 28 starting at the top of the pyramid and moving from left to right down the pyramid. Pressing the right-arrow key moves the cursor to the next higher-numbered card being displayed face up in the pyramid. The left-arrow key moves the cursor to the next lower-numbered card in the pyramid. The

cursor will not stop on an empty spot. If a card has been moved to the deck, the cursor skips that "empty" position in the pyramid. The cursor also has a wrap-around feature. If you move the cursor to the right side of the screen with the right arrow, pressing this key once more causes the cursor to move to the left side of the screen.

The Ups and Downs

Pressing the up-arrow key turns the next card in the deck over and places it on the top of the deck. If no legal move is available after turning over the next card, you must continue to press the up-arrow key until a legal move becomes available. The Cards Remaining Counter, displayed below the deck, keeps a running count of the remaining cards in the deck.

The down-arrow key is your "oops" key. Pressing the down-arrow key restarts the current game without shuffling the deck. You may use this option when you make a mistake, or if you want to play the same game with a different strategy.

The ENTER Key

Pressing ENTER takes the card situated beneath the cursor and places it on the top of the deck, if the move is legal. You can continue to play as long as legal moves remain. When a card in the pyramid is no longer covered by any other card, the computer turns that card face up.

The Space Bar

Pressing the space bar restarts the game. The deck is shuffled and you get a fresh game. Press Q or the BREAK key to stop the program.

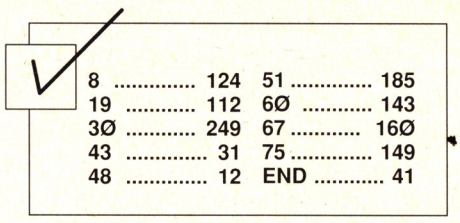
Summary

The program "knows" when the deck is empty, cards remain in the pyramid, and no legal moves remain. It informs you of your loss and displays the available options on the 32-column screen. The program also "knows" if you have won the game and announces this event in a similar manner. The program is as fast as it can possibly be since the cards are moved from the pyramid to the deck with GET and PUT commands. The only cards drawn are those that are turned over and those produced in the deck when you press the up-arrow key.

This game is very addictive. It is almost impossible to stop playing once you start. A lot of luck is needed to win, but a certain amount of strategy is also required since there are many times when three or more legal moves are possible at once.

Feel free to contact me if you have any questions about this game. For a response by mail please include an SASE. Or you may call me from 8 a.m. until 10 p.m. EST. ❑

32K Extended



8	124	51	185
19	112	6Ø	143
3Ø	249	67	16Ø
43	31	75	149
48	12	END	41

The Listing: PYRAMID2

```
Ø 'PYRAMID2
** WRITTEN BY GEORGE QUELLHORST
1 'COPYRIGHT (C) SEPTEMBER 1991
** BY FALSOFT, INC.
** RAINBOW MAGAZINE
2 DATA 112,1,94,25,13Ø,25,76,5Ø,
112,5Ø,148,5Ø,58,74,94,74,13Ø,74
,166,74,4Ø,98,76,98,112,98,148,9
8,184,98,22,122,58,122,94,122,13
Ø,122,166,122,2Ø2,122,4,146,4Ø,1
46,76,146,112,146,148,146,184,14
6,22Ø,146
3 CLEAR1ØØØ:SH=1:POKE14Ø,19Ø:EXE
C43350:DIM A(Ø,34),B(Ø,34),C(Ø,3
4),D(Ø,34),E(Ø,34),N$(13),X(29),
F(29),Y(29),CA(52):R=RND(-TIMER)
4 POKE65495,Ø:CLS:IFSH=1 THENPRI
NT@194,"PLEASE WAIT. SHUFFLING C
ARDS":GOSUB53
5 GOSUB48:GOSUB43:T=25:DE=29
6 ' CURSOR CONTROL
7 P$=INKEY$
8 DRAW"CØBM"+STR$(X(T))+","+STR$
(Y(T))+A$
9 IFDE=52 ANDMO=1 THENGOSUB63
1Ø IFP$=CHR$(8)THENT=T-1 ELSEIFP
$=CHR$(9)THENT=T+1 ELSE13
11 IFT=>29THENT=1ELSEIFT=ØTHENT=
28
12 IFF(T)=Ø OR F(T)=2 THEN1ØELSE
EXEC
13 IFP$=CHR$(13)THENF(T)=2:GOTO1
9 ELSEIFP$=CHR$(94)THENEXEC:GOTO
37
14 IFP$=CHR$(1Ø) THENSH=Ø:CA(Ø)=
AC:GOTO4ELSEIFP$=" "THENSH=1:GOT
O4
15 DRAW"C1BM"+STR$(X(T))+","+STR
$(Y(T))+A$
16 IFP$="Q"THENCLS:STOP
17 GOTO 7
18 ' THE ENTER KEY
19 GOSUB57:Q=Ø:EC=W:TT=T:T=Ø:GOS
UB57:Q=Ø:TC=W
2Ø IFEC-TC=1 OR EC-TC=12 OR TC-E
C=1 OR TC-EC=12 THENT=TT:GOTO22
21 GOSUB61:T=TT:F(T)=1:GOTO7
22 EXEC:H=T:GOSUB75:GOSUB71:H=Ø:
GOSUB72
23 H=T-1:GOSUB76:H=T+1:GOSUB77:C
N=T-(Y(T)/25):IFF(1)=2THEN67
24 L=CN-1:R=CN:IFY(L)=Y(R)THEN25
ELSEIFX(T)>112THEN28 ELSEIFY(L)<
>Y(R)THEN27
25 H=L:GOSUB7Ø:H=R:GOSUB7Ø
26 H=T-1:GOSUB73:H=T+1:GOSUB74:G
OTO29
27 H=R:GOSUB7Ø:H=T+1:GOSUB74:GOT
O31
28 H=L:GOSUB7Ø:H=T-1:GOSUB73:RS=
1:GOTO29
29 IFF(T-1)=2 THENTT=T:T=L:F(L)=
1:GOSUB47:GOSUB57:GOSUB55:Q=Ø:T=
TT
3Ø IFRS=1THENRS=Ø:GOTO32
31 IFF(T+1)=2 THENTT=T:T=R:F(R)=
1:GOSUB47:GOSUB57:GOSUB55:Q=Ø:T=
TT
32 CA(Ø)=CA(T)
33 T=T+1:IFT=>29THENT=1
34 IFF(T)=ØORF(T)=2 THEN33
35 MO=1:GOTO7
36 ' THE UP-ARROW KEY
37 IFDE=52 THENGOSUB61:GOTO7
38 TT=T:DE=DE+1:T=DE:X=1Ø:Y=1Ø:P
UT(X,Y)-(X+3Ø,Y+42),B,PSET
39 GOSUB57:DRAW"S4BM1Ø,1Ø"+A$:T=
Ø:GOSUB55
4Ø PUT(1Ø,55)-(4Ø,97),B,PSET:GOS
UB78:DRAW"S4CØBM13,6Ø"+R$(D1)+"B
R14"+R$(D2)
41 T=TT:Q=Ø:CA(Ø)=W:GOTO7
42 ' DRAW SCREEN
43 A$="R3ØD42L3ØU42":MO=1:F(Ø)=2
:PMODE4,1:PCLS5:SCREEN1,1:DRAW"S
4CØBM1Ø,1Ø"+A$:POKE178,54:PAINT(
2Ø,2Ø),,Ø:GET(1Ø,1Ø)-(4Ø,52),A,G
:GET(14Ø,1Ø)-(17Ø,52),B,G
44 T=Ø:X(Ø)=1Ø:Y(Ø)=1Ø:GOSUB47:R
ESTORE:FORT=1TO21:F(T)=Ø:READX(T
),Y(T):GOSUB46:NEXT:FORT=22TO28:
F(T)=1:READX(T),Y(T):GOSUB47:NEX
T
45 Q=Ø:W=Ø:T=Ø:GOSUB57:GOSUB55:Q
=Ø:FORT=22TO28:GOSUB57:GOSUB55:Q
=Ø:NEXT:DRAW"S4CØBM13,6Ø"+R$(2)+
"BR14"+R$(3):RETURN
46 PUT(X(T),Y(T))-(X(T)+3Ø,Y(T)+
42),A,PSET:DRAW"CØS4BM"+STR$(X(T
))+","+STR$(Y(T))+A$:RETURN
47 PUT(X(T),Y(T))-(X(T)+3Ø,Y(T)+
42),B,PSET:DRAW"CØS4BM"+STR$(X(T
))+","+STR$(Y(T))+A$:RETURN
48 N$(1)="BR3R3F3D4LU4H3LG3D4LU4
E3BL2BD5R7":N$(2)="BRR7FD2GL6GD2
R8ULDL8U2ER6EU2HBL6DLU":N$(3)="B
RR7FDGFD2GL7HUBRDFBR5EU2HL3BR3EU
HBL5GDBLUE":N$(4)="BR4R4D4R2L2D3
LU7BL2G4R6BL7E4"
49 N$(5)="BR9L9D3RU3BD3R7FD2GL7H
URDFBR5EU2H":N$(6)="BR9L8GD5FR7E
U2HL6BLU2EBGBD2BRGD2FR5EU2H":N$(
7)="R9DG6LE6UBL7DLU":N$(8)="BRR7
FDGFD2GL7HU2EHUEBRGDFR5BL5GD2FBR
5EU2HEUH":N$(9)="BRR7FD5GL8BR7EU
2BLEU2HBL5GD2FR5BL5BLHU2E"
5Ø N$(1Ø)="BR2RD7BR2L5BR2U6GLE2B
R6R7FD5GL7HU5EBRGD5FBR5EU5H":N$(
11)="BR4R5BL2D6GL5HURDFBR3EU6L2"
:N$(12)="R9D7L9U7BRD7BR7U7D6LF2R
2UL2":N$(13)="R2D7LULDRU7LDRBRBD
3E4R2GLG4BEF3R2HLH3":R$(Ø)="R7FD
5GL7HU5EBRGD5FBR5EU5HBL8"
51 C$(1)="BR13R3F3D5G1ØH1ØU5E3R3
```

```
F4E4":C$(2)="BR8R2F8DG8L2H8UE8":
C$(3)="BR10F9D2G2L2H3LGD3F2L6E2U
3HLG3L2H2U2E10":C$(4)="BR8R2F3D2
G3F2E3RF3D2G3LH3L2D3F2L6E2U3L2G3
LH3U2E3RF3E2H3U2E3":R$(1)="BR2RD
7BR2L5BR2U6GLE2BL5":FORP=2TO9:R$
(P)=N$(P):NEXTP:RETURN
52 ' SHUFFLE THE DECK
53 FORT=1TO52:CA(T)=T:NEXT:FORT=
1TO52:R=RND(52):S=CA(R):CA(R)=CA
(T):CA(T)=S:NEXT:SH=0:AC=CA(29):
CA(0)=CA(29):RETURN
54 ' DRAW CARDS ON SCREEN
55 DRAW"S4C0BM"+STR$(X(T)+6)+","
+STR$(Y(T)+20)+C$(Q):DRAW"S4BM"+
STR$(X(T)+4)+","+STR$(Y(T)+4)+N$
(W):POKE178,HC:PAINT(X(T)+15,Y(T
)+25),,0:RETURN
56 ' COMPUTE SUIT AND VALUE OF C
ARD
57 W=CA(T)
58 IFW<=13THENQ=Q+1:GOTO59:ELSEW
=W-13:Q=Q+1:GOTO58
59 IFQ<3THENHC=1ELSEHC=0
60 RETURN
61 POKE140,20:FORD=1TO10:EXEC:NE
XT:POKE140,190:RETURN
62 ' CHECK STATUS OF GAME
63 MO=0:TT=T:FORK=1TO28:IFF(K)=1
 THENT=K:GOSUB57:Q=0:TC=W:T=0:GO
SUB57:Q=0:EC=W:T=TT ELSE65
64 IFEC-TC=1 OR EC-TC=12 OR TC-E
C=1 OR TC-EC=12 THENRETURN
65 NEXTK:GOSUB61:CLS:PRINT@101,"
GAME IS OVER YOU LOST":PRINT@133
,STRING$(21,"*"):PRINT@205,"PRES
S:":PRINT@259,"SPACEBAR FOR ANOT
HER GAME":PRINT@323,"DOWN ARROW
FOR SAME GAME":PRINT@390,"PRESS
<Q> TO QUIT"
66 P$=INKEY$:IFP$=" "THENSH=1:GO
TO4ELSEIFP$=CHR$(10)THENSH=0:CA(
0)=AC:GOTO4ELSEIFP$="Q"THENCLS:S
TOPELSE66
67 CLS:PRINT@36,"WELL, YOU FINAL
LY DID IT.":PRINT@72,"YOU WON TH
E GAME":PRINT@104,"CONGRATULATIO
NS!":PRINT@129,STRING$(30,"*"):P
RINT@205,"PRESS:":PRINT@259,"SPA
CEBAR FOR ANOTHER GAME":PRINT@32
3,"DOWN ARROW FOR SAME GAME":PRI
NT@390,"PRESS <Q> TO QUIT
68 PLAY"T2L5;O2BAGDO1DO2ABG":GOT
O6
69 'PUT AND GET CARDS ON SCREEN.
70 PUT(X(H),Y(H))-(X(H)+30,Y(H)+
42),A,PSET:RETURN
71 PUT(X(H),Y(H))-(X(H)+30,Y(H)+
42),B,PSET:RETURN
72 PUT(X(H),Y(H))-(X(H)+30,Y(H)+
42),C,PSET:RETURN
73 PUT(X(H),Y(H))-(X(H)+30,Y(H)+
42),D,PSET:RETURN .
74 PUT(X(H),Y(H))-(X(H)+30,Y(H)+
42),E,PSET:RETURN
75 GET(X(H),Y(H))-(X(H)+30,Y(H)+
42),C,G:RETURN
76 GET(X(H),Y(H))-(X(H)+30,Y(H)+
42),D,G:RETURN
77 GET(X(H),Y(H))-(X(H)+30,Y(H)+
42),E,G:RETURN
78 ED=52-DE:DE$=STR$(ED):IFED<10
 THENMID$(DE$,1,1)="0" ELSEDE$=R
IGHT$(DE$,2)
79 D1=VAL(LEFT$(DE$,1)):D2=VAL(R
IGHT$(DE$,1)):RETURN
```

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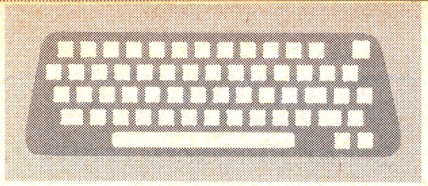

OS-9 Hotline

Basic to OS-9 Connection

THE RAINBOW Staff

? *I was very interested in Marty Goldstein's letter and your reply in the August 1991 issue about showing graphics with OS-9. It would combine my two main interests. But I don't know how to transfer my .CM3 and .MGE pictures to a disk formatted with OS-9. If I try it from BASIC, I get DF error. And if I try it from OS-9, I get Error 249 (wrong type) or Error 244 (read error). Can you help me?*

Dorothea Clement
Amityville, New York

a Several utilities are available for transferring files from Disk BASIC to OS-9. If you have access to CompuServe or Delphi, you can download RS20S9.BAS. This short BASIC program installs an OS-9 directory on a Disk BASIC disk, allowing you boot OS-9 and copy the files from that disk onto a standard OS-9 format disk. Also available is Bob Santy's excellent rsdos utility. This OS-9 program allows you to copy files between Disk BASIC and OS-9 in either direction. If you do not have access to either CompuServe or Delphi, you may want to look into the commercial utilities available. *GCS File Transfer Utilities* from Granite Computer Systems allows you to transfer files between OS-9, Disk BASIC, MS-DOS, Flex and Mini-Flex. For further information, read "Making the Move" by Tim Kientzle on Page 10 of this issue.

Terminal Warfare

? *I have a 512K CoCo 3, a CM-8 monitor, two FD-501 disk drives, a 40-track disk drive with a Disto controller, an RS-232 Pak, a Multi-Pak Interface, an Avatex 1200-bps modem, a DMP-106 printer and a Smith-Corona L-1000 printer.*

My problem is with XTerm, *which I bought about two years ago and cannot use. I boot OS-9 and enter* xmode /t2 baud=3 *to set* /t2 *for 1200 bps. I get connected but when I start to type, everything looks like the Greek alphabet. I have tried to operate at 300 bps, but the same thing happens. I have done everything that has been suggested and I still get the same results. I have* SuperComm *and it works perfectly. I also have* MikeyTerm *and* GETerm.

Augustus Harrison
Ticonderoga, New York

a We suspect *XTerm* is not stripping the parity bit from the received data. Depending on the system you are calling, you may need to experiment with the number of data bits and parity to achieve an acceptable connection. While most popular systems use 8-bits with no parity, some systems still operate at 7-bits with either even or odd parity. You can change the speed, number of data bits and parity by altering the baud and type values with the xmode utility. The baud parameter is split into two hexadecimal digits. The upper digit represents the number of data bits and the lower digit represents the speed. Use these values in the upper digit to set the number of data bits

Data bits	baud parameter
8-bits	0*x*
7-bits	2*x*

where *x* is the speed code in the lower digit from the following table:

Code	Speed
0	110 bps
1	300 bps
2	600 bps
3	1200 bps
4	2400 bps
5	4800 bps
6	9600 bps
7	19,200 bps

To set the parity in the type parameter, use the codes in the following table:

type	Parity
00	None
20	Odd
60	Even
A0	Mark
E0	Space

For example, to set /t2 for 1200 bps, 7 bits and even parity, use the command

```
xmode /t2 baud=23 type=60
```

If you find that 8-bit, no parity results in the Greek alphabet, try using 7-bit, even parity and then 7-bit, odd parity. If neither of those work properly, try using mark or space parity. Mark and space parity are rather unusual in that the parity bit is either always set (mark) or always reset (space). If you are still unable to obtain an acceptable connection, read the manual for the terminal program to see if it offers any assistance. Many of the better terminal programs offer a feature that strips the parity bit.

For more information on setting the parameters for the serial port, read pages 5-4 through 5-7 of the OS-9 Commands section of the OS-9 Level II manual. Also read the descriptions for the tmode (Page 6-87) and xmode (Page 6-100) commands.

Patching OS-9 Level I

? *I am writing in hopes that you or a reader of this column can help me. I have just obtained a copy of OS-9 Level*

I. It seems that it runs only on the CoCo 2. I read in an earlier issue of a patch available from Tandy to let you run the program on the CoCo 3. I am unable to purchase one from Radio Shack because it was discontinued in May 1990. I would appreciate help in obtaining this patch if it is available.

Mike Howard
Easley, South Carolina

A The best solution would be to obtain OS-9 Level II since it was designed specifically for the CoCo 3 and provides many advantages over OS-9 Level I. But for guidance to a patch that allows OS-9 Level I to work on the CoCo 3, read the next letter.

A Game's Solution

? *In "OS-9 Hotline" (August 1991, Page 40), you told Charles Rempel that the only version of OS-9 Level I that runs on the CoCo 3 is Version 2.00. I beg to differ; if you check Page 98 of the January 1989 issue, you will find "Tandy OS-9 Games Patch" by Marty Goodman. Although it is written as a game patch, you will find that it patches OS-9 Level I Version 1.00 or 1.01 to work with the CoCo 3.*

Ken Yarley
Columbus, Ohio

A Thanks for the tip.

Changing Slots

? *I am interested in knowing if there is a way to edit either the* `/t2` *device descriptor or the* `aciapak` *device driver to operate out of Slot 2 of the Multi-Pak Interface rather than Slot 1. I use* SuperComm 2.1 *as my main terminal program with OS-9 but would like to keep Slot 1 open for my kids, who use several ROM Pak games.*

I tried deleting both `aciapak` *and* `t2` *from my* `MODULES` *directory and replacing them with* `modpak` *and* `t3`*, but that seemed to work only at 300 bps. With* `aciapak` *and* `t2`*, I am able to run at 2400 bps with no problem, but I am limited to Slot 1. Alternatively, is it possible to modify either* `modpak` *or* `t3` *to operate at 2400 bps with* SuperComm 2.1*? I tried to set* `/t3` *to 2400 bps with* `xmode`*, but that didn't seem to help.*

Kent Holcomb
North Royalton, Ohio

A Changing the slot number requires disassembling the `aciapak` device driver, determining the location that changes the slot-select register in the Multi-Pak Interface and then either reassembling or patching the driver. We am not aware of any patches currently available. Perhaps one of our readers is aware of a patch and will forward that to us.

BASIC09-Vue

? *I have a 512K CoCo 3 with two disk drives and enjoy the many challenges of programming using BASIC09. I also have* Multi-Vue *but have been unable to determine from the manual an answer to the following question: Can I use BASIC09 with* Multi-Vue*? If so, what are the procedures for loading it?*

Burton Parke
Clearwater, Florida

A For further information on using the menuing capabilities provided with *Multi-Vue*, read "KISSable OS-9" (August 1988, Page 182) for BASIC09 source code to the `gfx3` module. You may also be interested in reading Dale's three-part series on *Maxic in Multi-Vue* (September, October and November 1990) and *MVFinance* (April 1990, Page 52). The complete source code to *Maxic* was provided on the August 1990 RAINBOW ON DISK. If you have access to CompuServe or Delphi, you may also be interested in downloading the complete assembly-language version of `gfx3` provided by Kevin Darling.

Using the Default Device

? *How do I use the* `/dd` *device? When I load it with* `/d0` *set as a 40-track, double-sided drive, I get error messages. The only way I can get* `/dd` *to work is with 35-track single-sided disks. How can I combine the two? My system includes two double-sided disk drives and 512K.*

Walter Jones
Georgetown, Delaware

A Located in the `MODULES` directory of the Boot/Config/BASIC09 disk are two files called `ddd0_35s.dd` and `ddd0_40d.dd`. The `ddd0_35s.dd` is the `/dd` descriptor configured for `/d0` as a 35-track, single-sided drive, and `ddd0_40d.dd` is the `/dd` descriptor configured for `/d0` as a 40-track, double-sided drive. Since you have two double-sided drives, you should replace `ddd0_35s.dd` in your `OS9Boot` file with `ddd0_40d.dd`. You can do this by using `config` to create a new boot disk or by using *EZGen* (available from Burke & Burke) to replace the current version of `dd` in your `OS9Boot` file with the version you need. If you want to use *EZGen*, insert a backup of your System Master disk into Drive `/d0` and the Boot/Config/BASIC09 into Drive `/d1`, and type the following:

```
ezgen /d0/os9boot
link dd
delete
insert /d0/modules/ddd0_40d.dd
quit
```

EZGen allows you to create a new boot disk from scratch, and you can add, delete or replace device drivers and descriptors on your existing boot disk. However, it is best to modify the `OS9Boot` file on a *backup* of your current OS-9 System Master. This allows you to easily recover, should a problem occur that renders the disk unbootable. Otherwise, you'll have to start from scratch anyway.

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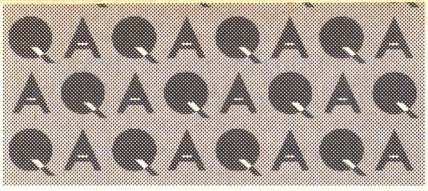

Power Connections

by Marty Goodman
Contributing Editor

I've seen some power adapters for 3½-inch drives that supply only 5 volts to the drive. What is going on here? Are some (or all) modern 3½-inch drives set up to use only 5 volts for both their circuitry and their motors?

Ed Dahlgren (EDDAHLGREN)
Colorado Springs, Colorado

Yep! Many of the more recent 3½-inch, 1.44-megabyte disk drives these days run both their motors and circuit boards off a single 5-volt supply. However, most (if not all) older 3½-inch drives — especially those that were 720K only and half-height (as opposed to the newer third-height drives that can operate as both 720K and as 1.44-megabyte drives) — do require both 5 and 12 volts.

CoCo Cat Fights Back

A while ago my cat sprayed my disk controller, and since then I've been getting some intermittent disk errors. What do you suggest?

Bruce Christianson (THEWANDERER)
Denver, Colorado

I suggest washing off the controller circuit board with lukewarm water. This should dissolve and rinse off any remaining salt left from the evaporated feline urine. You may also want to change your disk drive cable, for that could have gotten soaked with salty water too, causing corrosion at the connectors either where they connect to the disk drive or where they connect to the wires of the cable itself. Note that merely rinsing a circuit board in water then drying that off will not normally harm the board or any component on it.

MPI Cartridge Removal

I understand that inserting and removing cartridges from the CoCo's cartridge port while the power is on is dangerous. But is it also dangerous to insert or remove a cartridge from a slot in the Multi-Pak Interface if that slot is not currently selected?

Joe Sannucci (SANNUCCI)
Elizabeth, New Jersey

Actually, Joe, it is *more* dangerous to insert or remove a cartridge from the Multi-Pak when the power is on than it is to do so with the CoCo system port itself. This is true regardless of whether or not the slot in question is selected. Slot selection on the Multi-Pak involves switching three data lines (the *CART interrupt, the *CTS ROM-select line, and the *SCS I/O port address-decode line) among the four slots. The selected slot sees active signals from these lines, and unselected slots constantly see inactive signals. (In the case of *CART, unselected slots are unable to transmit a signal back to the CoCo.) But full power is being delivered to all lines on all slots of the Multi-Pak regardless of which slot is selected. Worse, while the CoCo 2 and 3 do not use pins 1 and 2 for anything, the Multi-Pak supplies +12 and -12 volts, respectively, on those pins. Right next to those two pins are the HALT and NMI lines, which go straight to the 6809 CPU without even being buffered. A jiggled cartridge can easily short +12 or -12 volts right into the 6809, frying it for good. Don't do it!

A Helping Hand with Lowercase

You were asked in a past installment of "CoCo Consultations" how to use true lowercase on a CoCo 2B with OS-9. You confessed ignorance of how to do this. Here's how: Enter

```
xmode /term type=1
```

This comes, I should add, straight from the OS-9 Level I V2.0 addendum.

Kent Bickley
Salt Lake City, Utah

Yes, my ignorance of OS-9 was showing. You are one of about a dozen folks who have contacted me, both by mail and in person at the recent Chicago RAINBOWfest, to point out my error. Thanks! I will, however, stand by my "overview" position that it is a waste of time to run OS-9 Level I when the far-more-capable Level II and CoCo 3 are so inexpensive.

Recommendations

I've seen you quote me as recommending use of 74F-series data buffers in Multi-Paks. That recommendation is not quite accurate. It is true that I have used 74F245 chips to solve problems encountered with 74LS245 data buffers in a product of mine (a buffered Y cable adaptor). However, I've found that not all brands of 74F-series chips work correctly. 74F245 chips made by Fairchild and NEC seem to work OK, but others do not. All 74AS245 chips work right, although, as do all 74LS645 and

---

Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator — sort of the Howard Cosell of the CoCo world. On Delphi, Marty is the SIGop of RAINBOW's CoCo SIG and database manager of OS-9 Online. His non-computer passions include running, mountaineering and outdoor photography. Marty lives in San Pablo, California.

74ALS645 chips. So I suggest you change your recommendation to CoCo users who want to replace the data buffers in their CoCo 3's and Multi-Paks to encouraging them to use the 74AS245, 74LS645 or the 74ALS645. Note that the 74645 chips are pin-for-pin replacements for the 74245 chips.

Bruce Isted (BRUCEISTED)
Calgary, Alberta
Canada

HDS Jumper Settings

Q *I own an HDS floppy-drive controller for which I have lost my documentation. It has two EPROM sockets, one for a 24-pin chip and the other for a 28-pin chip. The 28-pin socket is associated with a number of jumpers allowing it to be configured for 68766, 2764, or 27128 EPROMs. How do I set these jumpers?*

Zack Sessions (ZACKSESSIONS)
Castle Hayne, North Carolina

A The three staking pins, labeled A, B and C, select which of the two sockets is selected. When Pin B is jumpered to Pin A, the 24-pin ROM socket is selected. Jumpering Pin B to Pin C selects the 28-pin socket. Socket A accepts only Tandy-style 24-pin ROMs or 68766-type (8K-by-8) Motorola EPROMs. Pins D, E, F, G, H, I, J and K are used to configure the 28-pin socket to accept differing types of ROMs and EPROMs. If you plan on using a 2764 or 27128 chip, you should use jumpers to join pins H and G, pins F and E, and pins J and K. If you want to use the 28-pin socket with a 24-pin chip, you must set the jumpers so that G and F are joined, E and D are joined, and I and J are joined. In summary, use the following jumper settings:

27128 and most 2764 chips:
— H-G, F-E, J-K

24-pin ROMs and EPROMs:
— G-F, E-D, I-J

HDS 2764 setting:
— H-G, F-E, I-J

CM-1 Meets the Amiga

Q *I have acquired a CM-1 monitor from Radio Shack and was wondering whether it can be used with a Commodore Amiga?*

Robert Lang (WOODMAN)
West Orange, New Jersey

A The CM-1 is a very strange monitor and, as it stands, cannot be used with any standard video protocol on any computer currently made. It was designed for use only with the Tandy 2000, or with PC-compatibles if used with one of two Tandy video boards: 25-3047 and 25-4037. With the 25-3047, the CM-1 can be used as a CGA monitor with a PC-compatible, although with higher quality (EGA-quality) text in the CGA text modes. The 25-4037 board allows the CM-1 to be used with a PC-compatible and display EGA resolution graphics, although it still cannot display more than a total of 14 colors and black and white. Neither of these two Tandy video boards are available now. The CM-1 syncs at 25 KHz horizontal frequency, so it cannot be used with a CoCo, Amiga or Atari ST whose RGB video requires horizontal sync of 15.75 KHz. Its video luminance inputs are like that of an IBM CGA monitor (R, G, B and I). It is remotely possible that a CM-1 could be made to sync with an IBM-style EGA video signal, although you'd likely have to play a bit with its horizontal sync circuit, and without adding special chips for video input decoding, still would get only six colors plus black and white.

Getting Burned

Q *I recently purchased an Intronics Version 6 EPROM programmer for the Color Computer and am having trouble*

JWT Enterprises

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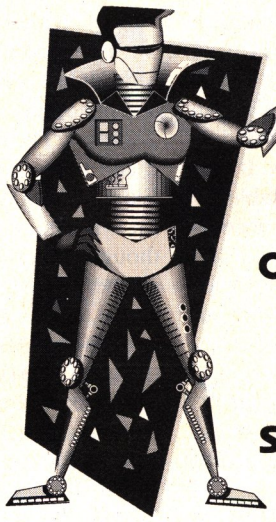

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loading the file EPROM.BIN *that I created for burning an* Extended ADOS-3 *EPROM. Can you help me?*

Tom Lucas (TOMLUCAS)
La Grange, Illinois

A Back when I was familiar with the Intronics EPROM burners for the Color Computer, the buffer for the EPROM started at address $2000. The file, EPROM.BIN, created by *Extended ADOS-3* is designed to load into the computer starting at location $4000 in memory. Thus, assuming that Version 6 of the Intronics burner puts its buffer where the earlier versions did (check your documentation on this) your problem may be solved by offset loading the EPROM.BIN file so it loads $2000 bytes lower in memory than it normally would. This is done by loading it using the command

```
LOADM "EPROM.BIN",&HE000
```

If you're using a tape system, substitute CLOADM for LOADM.

The Disk-to-Modem Connection

Q *Is there a way to connect the Direct Connect Modem Pak to my disk drive so I can upload and download software to the drive? Can I use the Direct Connect Modem Pak with* DeskMate*?*

Pete Fansler (ROBERT191)
Chattanooga, Tennessee

A To use either the (virtually worthless) DC Modem Pak or an RS-232 Pak with a Color Computer disk system, you need either a Multi-Pak Interface, a Slot Pak, a Y cable or some equivalent that allows you to put both the DC Modem Pak and the disk controller on the CoCo system bus. If you use a Y cable, you'll also need to disable the ROM inside the DC Modem Pak. I recommend you put the DC Modem Pak aside and instead use the 4-pin serial port on the Color Computer itself, in conjunction with an external modem. Later, if you like, you may want to get a Multi-Pak, a Slot Pak or a Y cable, and may decide to convert your DC Modem Pak into a general-purpose RS-232 port, as per the article I wrote for the July 1991 issue of THE RAINBOW.

The BASIC Connection

Q *How do I convert a BASIC program written for the IBM PC into one that can run on a CoCo?*

Robert Williams (BAWILLIAMS)
Cedar Hill, Missouri

A While both CoCo BASIC and GW-BASIC (for the PC) were written by Microsoft, they differ in the way some commands work, how each handles text positioning and graphics, and in what graphics modes are supported. You'll have to be very familiar with the details of both dialects of BASIC to translate programs between them. Indeed, if the program uses text formatting on the screen, or graphics to any considerable extent, you may find yourself effectively having to rewrite the program virtually from scratch. If the program uses only a very simple text display, conversion is much more feasible.

You should first save the program as an ASCII file on the PC. Then transfer the file to the CoCo by one of several methods: 1) Use a file-conversion program on the PC (*Xenocopy* or *CoCo Util*) to write the file to a CoCo-readable disk; 2) Use my CoCo/MS-DOS utilities, available on Delphi and in the June and July 1986 issues of THE RAINBOW, to read a single-sided MS-DOS disk on the CoCo; 3) Use a null-modem cable and communications programs to transfer the file from the PC to the CoCo; or 4) Upload the file from the PC to your Delphi Workspace and use your CoCo to download it.

Upgrading

Q *What is the best way to upgrade my wife's 16K Color Computer 2 with Color BASIC to 64K and Extended Color BASIC? Will the 4164s and Extended BASIC ROM from my CoCo 1 work in her CoCo 2?*

Keith Abbott (KEITHABBOTT)
Champaign, Illinois

A Whether the 4164 DRAMs and Extended Color BASIC ROM from your old CoCo 1 will work in your wife's CoCo 2 depends on exactly which model of CoCo 2 she has. The two earliest models of CoCo 2 can be upgraded using the same 24-pin Extended BASIC ROM and the same 4164 DRAMs that were used in a CoCo 1. Although you do have to know exactly which jumper to install to get it to use the bigger DRAM chips. Later-model CoCo 2's use two 4464 DRAMs to upgrade to 64K (these are the same type DRAMs used in the 128K CoCo 3) and use a single 28-pin ROM that has both Color BASIC 1.3 and Extended Color BASIC 1.1 in it. The memory upgrade on those later CoCo 2's does not require manipulating any jumpers, but the ROM upgrade requires moving five jumpers near the ROM socket from the 64K to the 128K positions. I give more details in my article on memory upgrades for the CoCo in the March 1989 issue of THE RAINBOW. Note that unless you can get the parts virtually free (as is the case for some hackers, although not for many CoCo owners), it might make more sense to just go out and buy a CoCo 3 while they are still available at the $99 closeout price.

Repairing Disk Drives

Q *I have a Qume 5¼-inch, 360K disk drive with a broken head. How might I go about repairing it so I can use it with an FD-502 drive setup?*

Robert Coates
Sandy Hook, Maintoba
Canada

A Don't bother attempting a repair! 5¼-inch, 360K drives should be considered disposable these days, for they are obsolete in the world of the PC-compatibles and are available used at surplus dealers and swap meets for as little as $10 to $25 each. New, they can be had for $30 to $60. Any attempt to repair a broken drive will likely involve your having to own disk drive alignment systems costing $90 or more.

Limiting Available Drives

Q *What is involved in limiting the number of drives used with* ADOS-3 *to two double-sided drives and the number to be used with OS-9 to three double-sided drives?*

Tom Thomas (TOMTHOMAS)
Janesville, Wisconsin

A The Color Computer disk controllers normally used (those made by Tandy, J&M, HDS and Disto) provide four drive-select lines. Of these, three are the normal Drive 0, 1 and 2 select lines. The line that Tandy calls the Drive 3 select line is on Pin 32, the line used by double-sided drives as a side-select line. Thus, under OS-9, which is quite capable of looking at a double-sided drive as a *single* drive, you cannot have more than three double-sided drives hooked up, for the fourth drive-select line must be used as a side-select line with the double-sided drives. Under *ADOS*, double-sided drives are accessed as if they were two virtual, single-sided drives. Each physical side of the disk in a double-sided drive is accessed as if it were a different drive number. Since Disk Extended BASIC provides for no more than four drives, the maximum number of physical double-sided drives you can use under *ADOS* is two, for each of those will be seen as two virtual drives by *ADOS*.

Hi-Res Interfacing

Q *How do I use the Tandy Hi-Res Joystick Interface in my BASIC programs? What codes am I to read?*

William Chamberlain
Nashville, Tennessee

A The Hi-Res Joystick Interface from Tandy requires the use of an assembly-language driver program. RAINBOW ran

an article on this by Steve Bjork ("CoCo Mouse," July through September 1986), the creator of the Hi-Res Joystick Interface. This article includes assembly-language source code you can use. Another article, by Duane Perkins (February 1988, Page 122), provides a machine-language routine in the form of a BASIC program.

Resisting Monitor Input

I read your reports about the video lines of the Tandy 1000 CGA video output possibly damaging the CM-8's inputs. So I put some resistors in series with the R, G and B lines to lower the voltages to the CM-8, and this seems to work quite nicely. Others may want to try this.

Also, I noticed that my CoCo 3 power supply runs rather hot. What do you think of putting a 150ma, 12-volt fan inside the CoCo, powering it off the voltage I obtain at each side of C62?

Allan Kimmel
Panama City, Florida

A I like your idea of inserting some dropping resistors in series with the R, G and B lines if trying to use a CM-8 with CGA-type video input. As for that fan, the power available from the CoCo's power transformer is quite limited, so I would not recommend powering it off any part of the CoCo's power supply. Instead, power it off a 12-volt wall transformer. If you use power from the CoCo, the transformer may get too hot, for it is rated for a power output within about 100 to 200ma of what it is delivering already. Adding an extra 150ma to its load does not seem to me like a good idea.

Modem Pak Blues

My modem software does not recognize my Direct Connect Modem Pak. What do you recommend?

Robert Newhart
Camden, New Jersey

A *VTerm*, *DelphiTerm*, and *MikeyTerm* all have provisions for operating with the DC Modem Pak (assuming you have a Multi-Pak Interface so you can use it with your disk drives, of course). The documentation for those programs, if you have the latest version, tells you how to alter the programs for use with the DC Modem Pak. Alternatively, my article in the July 1991 issue of THE RAINBOW explains how to turn a DC Modem Pak into an RS-232 pack. You will also see how to alter the address of the DC Modem Pak so that your terminal programs see it as an RS-232 pack addressed at $FF68 instead of $FF6C.

Flaky CoCo

I have a 512K CoCo 3 that is acting a little flaky. Sometimes it powers up as Disk Extended Color BASIC 2.1 *and other times it powers up as* Disk Extended BASIC 1.1. *It tends to crash during disk access. It has a 42-ohm resistor soldered across R22. Any suggestions?*

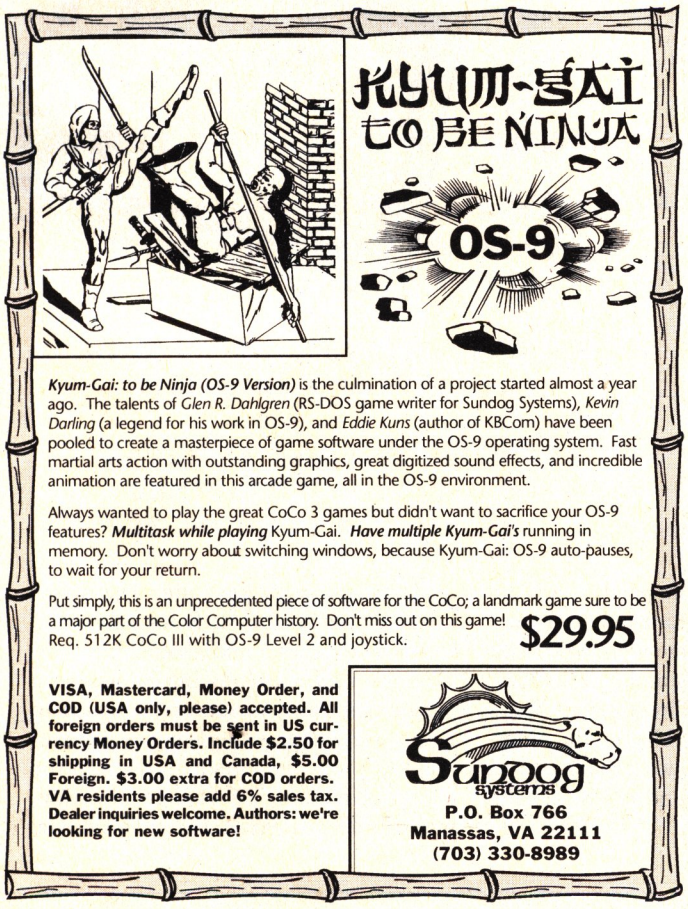
Richard Davis
Haverhill, Massachussettes

A Try removing that resistor and clipping out C65 and C66. These are tiny little green capacitors, one found in front of the memory-chip area and one found behind the memory-chip area.

Your technical questions are welcomed. Please address them to CoCo Consultations, THE RAINBOW, P.O. Box 385, Prospect, KY 40059.

We reserve the right to publish only questions of general interest and to edit for brevity and clarity. Due to the large volume of mail we receive, we are unable to answer letters individually.

Questions can also be sent to Marty through the Delphi CoCo SIG. From the CoCo SIG> prompt, pick Rainbow Magazine Services. Then at the RAINBOW> prompt, type ASK (for Ask the Experts) to arrive at the EXPERTS> prompt, where you can select the "CoCo Consultations" online form, which has complete instructions.



Kyum-Gai: to be Ninja (OS-9 Version) is the culmination of a project started almost a year ago. The talents of *Glen R. Dahlgren* (RS-DOS game writer for Sundog Systems), *Kevin Darling* (a legend for his work in OS-9), and *Eddie Kuns* (author of KBCom) have been pooled to create a masterpiece of game software under the OS-9 operating system. Fast martial arts action with outstanding graphics, great digitized sound effects, and incredible animation are featured in this arcade game, all in the OS-9 environment.

Always wanted to play the great CoCo 3 games but didn't want to sacrifice your OS-9 features? ***Multitask while playing*** Kyum-Gai. ***Have multiple Kyum-Gai's*** running in memory. Don't worry about switching windows, because Kyum-Gai: OS-9 auto-pauses, to wait for your return.

Put simply, this is an unprecedented piece of software for the CoCo; a landmark game sure to be a major part of the Color Computer history. Don't miss out on this game! Req. 512K CoCo III with OS-9 Level 2 and joystick. **$29.95**

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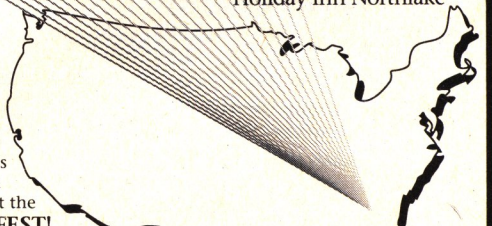

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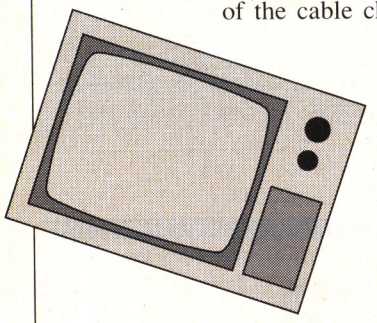
Novices Niche

Home Help/4K Standard

Cable TV
by John Norris

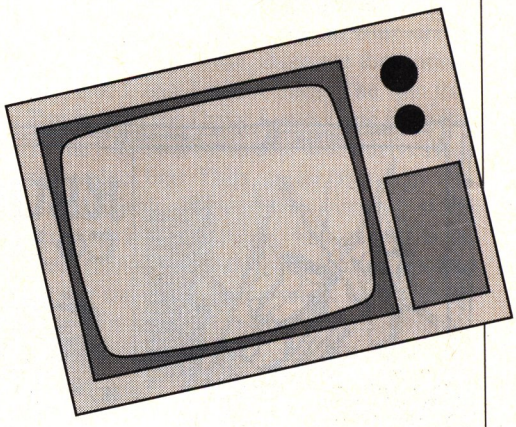
Do you find yourself continually wrestling with the local cable listing to figure out which station is on which channel? If so, this short program may be able to assist you in quickly locating those hard-to-find stations. *Cable TV* prints a small, two-column listing of all the local cable channels, using the DMP-130's Microfont. The listing can be taped to the back of most remote controls.

The program currently prints a list of the cable channels in my area, so substitute the cable channels for your area in lines 20 through 30. You may also add more than 38 channels to the listing, although the limitation depends on the size of your remote control. The printer control codes in Line 10 set the Tandy DMP-130a printer to Microfont. For other printers without Microfont, try using super- or subscripts and change the linefeed to reduce the vertical size of the channel listing.



The Listing: CABLETV

```
1 'CABLE TV
2 'WRITTEN BY JOHN NORRIS
3 'COPYRIGHT 1991 FALSOFT, INC.
10 PRINT#-2,CHR$(27);CHR$(77)
20 PRINT#-2,"2 BALT          21 MA
X"
21 PRINT#-2,"3 20 WASH       22 AM
C"
22 PRINT#-2,"4 WASH          23 TN
T"
23 PRINT#-2,"5 WASH          24 WO
R"
24 PRINT#-2,"6 WASH          25 TB
S"
25 PRINT#-2,"7 WASH          26 ES
PN"
26 PRINT#-2,"8 MEU           27 CN
N"
27 PRINT#-2,"9 WASH          28 HN
N"
28 PRINT#-2,"10 45 BALT      29 WE
ATHR"
29 PRINT#-2,"11 BALT         30 HM
SHOP"
30 PRINT#-2,"12 MPT          31 MT
V"
31 PRINT#-2,"13 BALT         32 WH
MM"
32 PRINT#-2,"14 54BALT       33 DS
C"
33 PRINT#-2,"15 HBO          34 A&
E
34 PRINT#-2,"16 SHO          35 LI
F"
35 PRINT#-2,"17 DIS          36 TN
N"
36 PRINT#-2,"18 HTS          37 AA
SCHL"
37 PRINT#-2,"19 JONES        38 NI
K"
38 PRINT#-2,"20 TMC          39 FA
M"
41 END
```



A Color Doodler
by Keiran Kenny

Graphics/CoCo 3

With *Color Doodler*, you can draw lines, of any length and at any angle, in 15 different colors anywhere on the screen. Press 2 on the menu screen to start a new picture. On the next screen a color bar is drawn with colors labelled 0 through 9 and A through F, representing the 16 palette registers. Colors 0 through 7 are the default colors for those slots. Colors 8 through F are poked into palette registers 8 through 15 by the routine in lines 80 and 90. (These colors are intended for an RGB monitor.) Press any key and a green flashing cursor is shown at screen center. Press a color key, 0 to E, to change the color. You cannot select F (black). Black is used only for the background color and the eraser (Line 530).

The movement keys are: The arrow keys; W for northeast; S for southeast; ALT for northwest and CTRL for southwest. You can start drawing at the screen center, or move your cursor if you want to begin elsewhere. A single tap on a movement key sets the cursor moving in the chosen direction. To change direction, press another movement key. To stop the

cursor movement temporarily, press any key except a movement key or a function key — I recommend the spacebar. If the cursor is moving diagonally, it stops when it reaches a screen boundary and remains there until you move it along or away from the boundary.

The function keys are: F2 to draw your line; N to erase the last line; P to save your picture; H to see the color bar; and CLEAR to end the program. Line 100 disables the BREAK key while you are drawing.

To draw a line, press a color key and then press F1 to mark the beginning of the line. Move the cursor, and when it is where you want the line to end, press F2. You can move the flashing cursor across or along existing lines, but if you erase a line, you will cut gaps in any lines the eraser crosses. If you press H while you are drawing, the color bar will be superimposed on the screen like a window. Press a color key to choose a color, or press any other key (except a movement or function key) to restore the graphic screen with the last chosen color unchanged.

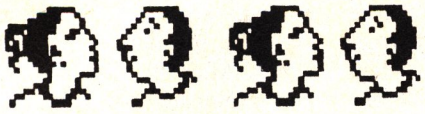
As you draw each line, the values for its color (CL) and its parameters (H1, V1, H2 and V2) are stored in arrays. In Line 10 the program dimensions enough space for 500 lines. The variable NR in Line 510 keeps the line count. When your picture is complete, or if you want to take a break, press P. The routine in lines 620 to 720 saves the arrays to tape or disk and ends the program. If you have a disk drive plugged in, the arrays are saved to disk, otherwise to tape. Line 20 establishes the device value, DV=1 or DV=-1, accordingly.

To load a saved picture, run the program and press 1 at the first screen. Then enter the filename. The load routine is in lines 230 to 320. When you load a picture, the cursor is set at the end of the last line loaded onto the screen. You can then select a color, add lines to your picture and save it again.

If you use *ADOS-3*, you'll need to make a couple of minor changes to *Color Doodler*. In Line 480, change 189 to 23. In Line 500, change 103 to 226.

The Listing: CLRDUDLR

```
0 'A COLOR DOODLER
1 'WRITTEN BY KEIRAN KENNY
2 'COPYRIGHT (C) MAY 1991
3 'BY FALSOFT, INC.
4 'RAINBOW MAGAZINE
10 DIMCL(500),H1(500),V1(500),H2
(500),V2(500)
20 IFPEEK(&H15F)=196THENDV=1ELSE
DV=-1
30 CLS:PRINT@160,"YOU CAN:":PRIN
T@227,"1 LOAD A SAVED PICTURE, O
R":PRINT@291,"2 DRAW A NEW PICTU
RE."
40 K$=INKEY$:IFK$<>"1"ANDK$<>"2"
THEN40
50 IFK$="1"THENLD=1:CLS:PRINT@22
4,"";:LINEINPUT"LOAD FILENAME: "
;F$
60 POKE65497,0
70 PALETTERGB
80 FORSL=8TO15:READPL:PALETTESL,
PL:NEXT
90 DATA 24,33,40,43,48,52,56,0
100 POKE41598,255
110 HSCREEN2:HCLS15
120 A$="0123456789ABCDEF"
130 HBUFF1,2552:HBUFF2,2552
140 B$="*COLOR DOODLER*":B=9:CL=
0:FORT=1TO15:HCOLORCL:HPRINT(B,3
),MID$(B$,T,1):B=B+1:CL=CL+1:NEX
T
150 C$="by Keiran Kenny":B=9:CL=
0:FORT=1TO15:HCOLORCL:HPRINT(B,5
```

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```
),MID$(C$,T,1):B=B+1:CL=CL+1:NEX
T
160 HCOLOR0:HPRINT(11,9),"YOUR C
OLORS:"
170 HLINE(14,87)-(264,103),PSET,
B
180 B=2:FORT=1TO16:HPRINT(B,11),
MID$(A$,T,1):B=B+2:NEXT
190 CR=0:FORL=15TO263STEP16:HCOL
ORCR:HLINE(L,96)-(L+8,102),PSET,
BF:CR=CR+1:NEXT
200 HGET(14,87)-(264,103),1
210 HCOLOR0:HPRINT(10,14),"PRESS
 ANY KEY"::EXEC44539:K$=INKEY$:H
CLS15
220 IFLD=0THEN330
230 POKE65496,0
240 OPEN"I",#DV,F$
250 INPUT#DV,NR
260 FORZ=1TONR
270 INPUT#DV,CL(Z),H1(Z),V1(Z),H
2(Z),V2(Z)
280 HCOLORCL(Z):HLINE(H1(Z),V1(Z
))-(H2(Z),V2(Z)),PSET
290 X=H2(Z):Y=V2(Z)
300 NEXTZ
310 CLOSE#DV
320 POKE65497,0:GOTO340
330 X=160:Y=96
340 PK=PEEK(135)
350 IFPK=80THEN620
360 IFPK=72THENHGET(14,87)-(264,
103),2:HPUT(14,87)-(264,103),1:E
XEC44539:HPUT(14,87)-(264,103),2
370 IFPK>47ANDPK<58THENK=PK-48:H
COLORK ELSEIFPK>64ANDPK<70THENK=
PK-55:HCOLORK
380 IFX=0AND(PK=189ORPK=64)THENP
OKE135,0:GOTO340
390 IFX=319AND(PK=87ORPK=83)THEN
POKE135,0:GOTO340
400 IFY=0AND(PK=64ORPK=87)THENPO
KE135,0:GOTO340
410 IFY=191AND(PK=189ORPK=83)THE
NPOKE135,0:GOTO340
420 IFPK=94THENY=Y-1
430 IFPK=10THENY=Y+1
440 IFPK=8THENX=X-1
450 IFPK=9THENX=X+1
460 IFPK=64THENY=Y-1:X=X-1
470 IFPK=87THENY=Y-1:X=X+1
480 IFPK=189THENY=Y+1:X=X-1
490 IFPK=83THENY=Y+1:X=X+1
500 IFPK=103THENH1=X:V1=Y:HSET(H
1,V1)
510 IFPK=4THENH2=X:V2=Y:HLINE(H1
,V1)-(H2,V2),PSET:NR=NR+1:CL(NR)
=K:H1(NR)=H1:V1(NR)=V1:H2(NR)=H2
:V2(NR)=V2:POKE135,0
520 IFPK=12THEN610
530 IFPK=78THENHCOLOR15:HLINE(H2
,V2)-(H1,V1),PSET:NR=NR-1:HCOLOR
CL(NR):X=H1:Y=V1:POKE135,0
540 IFY<0THENY=0
550 IFY>191THENY=191
560 IFX<0THENX=0
570 IFX>319THENX=319
580 BG=HPOINT(X,Y)
590 HSET(X,Y):FORDL=1TO100:NEXT:
HSET(X,Y,BG)
600 GOTO340
610 POKE65496,0:POKE41598,3:RGB:
WIDTH32:CLS:END
620 POKE135,0
630 POKE65496,0:POKE41598,3:RGB:
WIDTH32:CLS
640 PRINT@224,"";:LINEINPUT"SAVE
 FILENAME: ";F$
650 OPEN"O",#DV,F$
660 PRINT#DV,NR
670 FORZ=1TONR
680 PRINT#DV,CL(Z),H1(Z),V1(Z),H
2(Z),V2(Z)
690 NEXTZ
700 CLOSE#DV
710 CLS:PRINT@224,"FILE "F$" SAV
ED"
720 END
```

Spelling Helper/16K Standard

Vocabulary Aid

by Keiran Kenny

Vocabulary Aid presents a hands-on approach through which you can learn correct word spellings and definitions. Words can be selected to match the user's level. Lines 1000 through 2000 contain some fairly difficult examples. In each line, the first item is a word and the second item is the meaning (for example, 1109 DATA MONUMENTAL,VERY LARGE). Notice how the DATA statements are placed in four groups. The first group in lines 1000 through 1010 contains 10 words and ends with an empty entry (1010 DATA "","""). The second group in lines 1100 through 1110 also contains 10 words. The third group in lines 1200 through 1204 contains four words, and the fourth group in Line 2000 contains only an empty entry. An empty entry is used to end all four groups.

When you run the program, the 10 words and meanings from the first group are displayed. Press the space bar when you are ready, and a randomly selected meaning from the first group is displayed with the associated word displayed below it. However, notice that every other character in the word is replaced with an asterisk (*). Your job is to determine which word fits the pattern and replace the asterisks with the appropriate letters.

It may look easy, but you may have to consciously spell each word as you type or you can easily make mistakes. This, in itself, can further reinforce the process of learning the correct spelling of the words. After each word, follow the prompt and press any key for the next word.

When you finish all 10 words in the first group, the 10 words in the second group are shown. This group is played in the same manner as the first group of words. After this, the four words in the third group are shown. When you finish these four words, the total number of words from all of the groups is shown along with the number of correct responses.

You can add as many words and meanings to the groups as you choose. Although you can create any number of groups, limit the number of words in each group to a maximum of 10. Also, use only single words without hyphens or apostrophes because the typing routine in lines 190 through 260 responds only to the letters A through Z. Don't forget to include a null word and meaning pair as the last entry in each group.

The Listing: VOCABLRY

```
1 'VOCABULARY AID
2 'WRITTEN BY KEIRAN KENNY
3 'COPYRIGHT 1991 FALSOFT, INC.
10 CLS
20 DIMA$(11),B$(11)
30 P=0
40 FORT=1TO11:READA$(T),B$(T):IF
T=1ANDA$(T)=""THEN340ELSEIFA$(T)
=""THEN50ELSEPRINT@P,A$(T)": "B$
(T):P=P+32:NEXT
50 T=T-1:PRINT:PRINT"READ THESE
WORDS AND THEIR MEAN-INGS, AND L
EARN TO SPELL THE    WORDS. PRES
S THE <SPACEBAR> WHENYOU ARE REA
DY FOR A TEST."
60 K$=INKEY$
70 K$=INKEY$:IFK$<>CHR$(32)THEN7
0ELSECLS
80 FORX=1TO T
90 PRINT@32,"THIS WORD MEANS:"
100 R=RND(T):IFB$(R)=""THEN100EL
SEPRINT@112-LEN(B$(R))/2,B$(R)
110 B$(R)=""
120 FORL=1TO LEN(A$(R))
130 IFL/2=INT(L/2)THENC$="*"ELSE
C$=MID$(A$(R),L,1)
140 D$=D$+C$
```

```
150 NEXT
160 P=176-LEN(D$)/2
170 PRINT@P,D$;
180 PRINT@451,"TYPE THE MISSING
LETTERS."
190 FORPL=1TOLEN(D$)
200 E$=MID$(D$,PL,1)
210 IFE$<>"*"THEN240
220 K$=INKEY$:IFK$=""ORK$<"A"ORK
$>"Z"THEN220
230 PRINT@P,K$;:E$=K$
240 F$=F$+E$
250 P=P+1
260 NEXT
270 IFF$=A$(R)THENR$="RIGHT!":RT
=RT+1ELSER$="SORRY!"
280 R$=R$+" "+"IT WAS "+CHR$(34)
+A$(R)+CHR$(34)+"."
290 PRINT@240-LEN(R$)/2,R$
300 PRINT@451,"PRESS ANY KEY."
310 EXEC44539:CLS:D$="":F$="":NR
=NR+1:K$=INKEY$
320 NEXT
330 CLS:GOTO30
340 CLS:PRINT@138,"END OF TEST"
350 PRINT@195,"YOU HAD"RT"RIGHT
OUT OF"NR;CHR$(8)"."
360 PRINT@257,"PRESS r TO REPEAT
 OR e TO END."
370 K$=INKEY$:IFK$=""THEN370
380 IFK$="R"THENCLS:RUN
390 IFK$="E"THENCLS:END
400 GOTO370
1000 DATA SUFFICIENT,ENOUGH
1001 DATA LETHARGY,LACK OF ENERG
Y
1002 DATA MATURE,GROW UP
1003 DATA TENEBROUS,DARK
1004 DATA MULTITUDE,CROWD
1005 DATA NARRATIVE,STORY
1006 DATA INDEPENDENCE,FREEDOM
1007 DATA INFANTILE,CHILDISH
1008 DATA INDIGNATION,ANGER
1009 DATA NAUSEATING,SICKLY
1010 DATA "",""
1100 DATA OBLITERATE,WIPE OUT
1101 DATA NOURISHMENT,FOOD
1102 DATA PROCRASTINATE,DELAY
1103 DATA SHUFFLE,MIX
1104 DATA SUPERFLUOUS,MORE THAN
ENOUGH
1105 DATA REQUIREMENT,NEED
1106 DATA MILITARISTIC,WAR LIKE
1107 DATA QUADRILATERAL,FOUR SID
ED
1108 DATA MONUMENTAL,VERY LARGE
1109 DATA HIRSUTE,HAIRY
1110 DATA "",""
1200 DATA GIGANTIC,VERY LARGE
1201 DATA DIMINUTIVE,SMALL
1202 DATA EXECRABLE,BAD
1203 DATA DISEASED,SICK
1204 DATA "",""
2000 DATA "",""
```

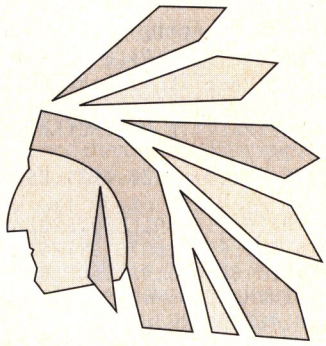
Playtime/CoCo 3

Indians

by Ruth E. Golias

Indians is a musical program that plays the song "Ten Little Indians." After you run the program, a picture is drawn on HSCREEN2, and the words to the song are displayed while the music is played. (Can you find the other nine indians?)

This program is designed for use with



*** EXTENDED * ADOS-3**

*** Built-in RAMdisk * Point-and-pick file select menu ***

Not a new version of ADOS-3, but a new product that shares space with ADOS-3 in a 16K EPROM. Arrow-key selection of files to execute. LOAD, COPY, KILL or SCAN. The BACKUP command is doubled in speed for full disks, proportionately faster for partly full disks. (BACKUPs to or from the RAMdisk typically take 5 to 20 sec.) • BACKUP-with-format • Wild-card COPY and KILL, with optional prompting for individual files • Date (or date/time with hardware clock) displayed for files in the directory, printed on LLISTings • DATE$ function • Key repeat • Block move/copy of BASIC program lines • Text screen printer dump • Auto-reboot of a BASIC program or the DOS command • Parallel printing • Read/write/format 35/40 tracks on 80-track drives • Supports 3 double-sided drives plus 2 RAMdrives • Allows different numbers of tracks on different drives • Shares the original's excellent compatibility with commercial software. For 128K CoCo 3 with ADOS-3 (RAMdisk use requires 512K). Includes information on having an EPROM burned (cost is $15) after configuring Extended ADOS-3. Disk, **$29.95**. Extended ADOS-3 plus ADOS-3, **$49.95**. Driver for Disto real-time clock, **$5**. Adapter for controllers lacking 28-pin socket, **$10**. SmartWatch real-time clock (Tandy 25-1033 equiv.), **$35** (Drivers for Ext. ADOS-3 and OS-9 included; usable in 28-pin socketed controllers or in Rompack, **$10**).

"...will blow your socks off...impossible to give Extended ADOS-3 anything other than a rave review."
— Rainbow, October 1989.

"Flawless, compatible operation with just about everything under the sun...by far the most USEFUL product ever devised for the Color Computer."
— CoCo Clipboard, Sept/Oct 1989.

ADOS-3 (reviewed July 1987)
Customize default startup message, colors, screen width, baud rate, step rates, processor speed, number of tracks (35, 40, or 80). Disk I/O and printing are reliable at double CPU speed. Extra commands such as FAST, SLOW, AUTO, RUNM, SCAN, CAT, PRT ON/OFF. Keystroke macros, arrow-key scroll through BASIC programs, edit/repeat of last command, auto-edit of error line, ML monitor, lots more. Usable as a disk utility or in EPROM. 128K Coco 3. EPROM-burning (cost is $15-20) information provided. Disk, **$24.95**. **ADOS** for CoCo 1 and 2 Disk, **$14.95**.

FOR OS-9: SmartWatch real-time clock with driver, **$29.95**; in Rompack, **$39.95**.

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As seen at Chicago RainbowFest 1991.

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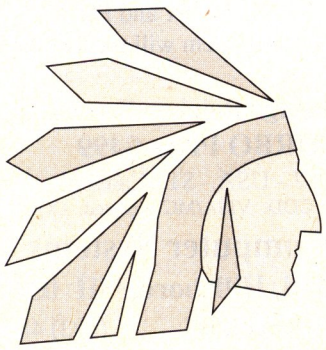
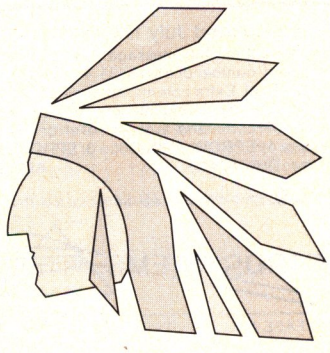
a composite monitor. If you use an RGB monitor, replace Line 20 with the line listed below. These changes to the palette slots give a close representation to the original composite colors.

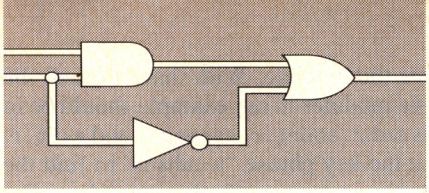
```
20 HSCREEN2:PALETTE RGB:PALETTE
0,24:PALETTE 1,34:PALETTE 2,0:PA
LETTE 3,4:PALETTE 4,10:PALETTE 5
,7:PALETTE 6,0:PALETTE 7,2:PALET
TE 8,0:PALETTE 9,55:HCLS0
```

The Listing: INDIANS

```
5 '============================
6 '    TEN LITTLE INDIANS
7 '           BY
8 '      RUTH E. GOLIAS
9 '============================
10 GOSUB1130
20 HSCREEN2:PALETTE CMP:PALETTE
0,46:PALETTE 1,21:PALETTE 2,0:PA
LETTE 3,7:PALETTE 4,45:PALETTE 5
,32:PALETTE 6,16:PALETTE 7,1:PAL
ETTE 8,62:PALETTE 9,3:HCLS0
30 HCOLOR 7
40 HLINE(0,140)-(320,192),PSET,B
F
50 A$="D12F1D15F3D1L10U1E2U12H2U
3;R2U15L7D15R7;BL6D7G1D9F2D1L11U
1E3U15;E1U16BU4F5;BR7E5D7;BU7U3G
6L7;E3R1U1H1NG1E5H5G3F3G3NF2;BG4
G9F2E6NE4G2;BU8BR3U1H7L1U3E9;BD9
D4NH2F3D1;BL1BU18NL1F1R7E1R1;F1R
3F4D3F1D2F1D2G1D5;F1D3F1D1F1D1G1
L5U5H2BU4U7"
60 HDRAW"BM100,150;C2;XA$;"
70 HPAINT(98,153),1,2
80 HPAINT(86,154),1,2
90 HPAINT(95,153),2,2
100 HPAINT(90,146),2,2
110 HPAINT(78,151),2,2
120 HPAINT(92,136),2,2
130 HPAINT(92,126),1,2
140 HCIRCLE(92,114),10,2,1,.38,.
15
150 HPAINT(90,114),1,2
160 HDRAW"BM100,113;C2;H5L5D1G3L
1;L3G4D2G2D4E3U1E1U1E1;BU3H4E4F3
"
170 HPAINT(100,112),2,2
180 HPAINT(80,117),3,2
190 HPAINT(80,110),5,2
200 HSET(96,114,4):HSET(90,114,4
)
210 HDRAW"BM94,118;C2;L2"
220 HDRAW"BM135,164;S8;C2;E44NE4
NU4NH4F44L29H15G15NR29L29"
230 HPAINT(223,160),6,2
240 HPAINT(237,100),5,2
250 HDRAW"BM130,184;R5U1R2U2L7D1
L1D1R1D1;BR15BU6R7U1R1U1L2U1L3D1
L1D1L2D1;BR16BD4R4U1L1U1L2D1L1D1
;BD4BR20R7U1R1U1L2U1L3D1L2D1L1D1
;BR16BU6R5U1R3U2L8D1L1D1R1D1"
260 HPAINT(132,183),9,2
270 HPAINT(168,170),9,2
280 HPAINT(196,178),9,2
290 HPAINT(241,186),9,2
300 HPAINT(270,175),9,2
310 HDRAW"BM20,174;R6U1R2U3L8D1L
1D1R1D2"
320 HPAINT(22,172),9,2
330 FOR D=1 TO 500:NEXT D
340 HCOLOR 6
350 HPRINT(1,3),"ONE LITTLE,"
360 PLAY"T3;V30;O2L4FL8FF"
370 HSET(206,158,4):HSET(210,158
,4)
380 HPRINT(13,3),"TWO LITTLE,"
390 PLAY"L4FL8FF"
400 HSET(216,156,4):HSET(220,156
,4)
410 HPRINT(25,3),"THREE LITTLE "
420 PLAY"L4AO3L8CC"
430 HPRINT(32,5),"INDIANS,"
440 PLAY"O2L4AF"
450 HPAINT(0,24),0,2
460 HSET(212,148,4):HSET(216,148
,4)
470 HPRINT(1,3),"FOUR LITTLE,"
480 PLAY"GL8GG"
490 HSET(218,142,4):HSET(222,142
,4)
500 HPRINT(14,3),"FIVE LITTLE,"
510 PLAY"L4GL8GG"
520 HSET(222,139,4):HSET(226,139
,4)
530 HPRINT(27,3),"SIX LITTLE"
540 PLAY"L4EL8GGL4EC"
550 HPAINT(0,24),0,2
560 HSET(224,147,4):HSET(228,147
,4)
570 HPRINT(1,3),"SEVEN LITTLE,"
580 PLAY"FL8FF"
590 HSET(226,152,4):HSET(230,152
,4)
600 HPRINT(15,3),"EIGHT LITTLE,"
610 PLAY"L4FL8FF"
620 HSET(230,161,4):HSET(234,161
,4)
630 HPRINT(29,3),"NINE LITTLE"
640 PLAY"L4AO3L8CCO2L4AF"
650 HPAINT(0,24),0,2
660 HPAINT(32,40),0,2
670 HSET(232,155,4):HSET(236,155
,4)
680 HPRINT(1,3),"TEN LITTLE INDI
AN BOYS."
690 PLAY"O3L4CO2L8B-B-L4AGL2.F"
700 FOR D=1 TO 500:NEXT D
710 HPAINT(0,24),0,2
720 HSET(232,155,6):HSET(236,155
,6)
730 HPRINT(1,3),"TEN LITTLE,"
740 PLAY"L4FL8FF"
750 HSET(230,161,6):HSET(234,161
,6)
760 HPRINT(13,3),"NINE LITTLE,"
770 PLAY"L4FL8FF"
780 HSET(226,152,6):HSET(230,152
,6)
790 HPRINT(26,3),"EIGHT LITTLE"
800 PLAY"L4AO3L8CC"
810 HPRINT(32,5),"INDIANS,"
820 PLAY"O2L4AF"
830 HPAINT(0,24),0,2
840 HSET(224,147,6):HSET(228,147
,6)
850 HPRINT(1,3),"SEVEN LITTLE,"
860 PLAY"L4GL8GG"
870 HSET(222,139,6):HSET(226,139
,6)
880 HPRINT(15,3),"SIX LITTLE,"
890 PLAY"L4GL8GG"
900 HSET(218,142,6):HSET(222,142
,6)
910 HPRINT(27,3),"FIVE LITTLE"
920 PLAY"L4EL8GG"
930 HPRINT(32,5),"INDIANS,"
940 PLAY"L4EC"
950 HPAINT(0,24),0,2
960 HSET(212,148,6):HSET(216,148
,6)
970 HPRINT(1,3),"FOUR LITTLE,"
980 PLAY"FL8FF"
990 HSET(216,156,6):HSET(220,156
,6)
1000 HPRINT(14,3),"THREE LITTLE,
"
1010 PLAY"L4FL8FF"
1020 HSET(206,158,6):HSET(210,15
8,6) 'OUT 2 EYES
1030 HPRINT(28,3),"TWO LITTLE"
1040 PLAY"L4AO3L8CCO2L4AF"
1050 HPAINT(0,24),0,2
1060 HPAINT(32,40),0,2
1070 HPRINT(1,3),"ONE LITTLE IND
IAN BOY."
1080 PLAY"O3L4CO2L8B-B-L4AGL2.F"
1090 HDRAW"BM26,163;C2;R2U1R1U1R
1E1H1L1G2L2U1L1U1L2D1R1D1R1D1R1D
1R1F1R2E1U2"
1100 HPAINT(27,162),3,2
1110 HPAINT(28,164),1,2
1120 GOTO1120
1130 PMODE3,1:PCLS:SCREEN1,0:CLS
3
1140 FOR X=1 TO 4
1150 PRINT@294," TEN LITTLE INDI
ANS ";
1160 FOR D=1 TO 1000:NEXT D
1170 FOR B=130 TO 157 STEP 3:PRI
NT@B,CHR$(191);:NEXT
1180 FOR B=295 TO 312:PRINT@B,CH
R$(191);:NEXT
1190 FOR B=296 TO 308:PRINT@B,CH
R$(239)+CHR$(255)+CHR$(159)+CHR$
(191);:NEXT
1200 FOR B=308 TO 295 STEP-1:PRI
NT@B,CHR$(223)+CHR$(159)+CHR$(25
5)+CHR$(191);:NEXT
1210 SOUND RND(25),RND(3)
1220 NEXT X
1230 FOR B=294 TO 300:PRINT@B,"
TEN LITTLE INDIANS ";
1240 SCREEN0,1
1250 FOR D=1 TO 1500:NEXT D
1260 RETURN
```







Creating a C Library

by Greg Law
Technical Editor

Once you've written, debugged and compiled a set of functions you use often, you can store these functions in a library file in the /dd/LIB directory. As outlined in previous columns, some of the functions you may want to add to a library include the new OS-9 Level II system calls, text and graphics display functions and any other functions you plan to use more than once. A single relocatable object module typically has an extension of .r (such as fopen.r or fwrite.r), and a set of relocatable object modules merged into a library typically has an extension of .l (such as clib.l or cgfx.l). And since a library is nothing more than several relocatable object modules merged into one file, you may think you can simply merge all of your relocatable object modules into a library file. If only it were that simple.

```
struct
{
     long     H_Sync;
     unsigned H_TyLang;
     char     H_Valid;
     char     H_Date[5];
     char     H_Edition;
     char     H_Spare;
     unsigned H_Global;
     unsigned H_DGlobal;
     unsigned H_Data;
     unsigned H_DData;
     unsigned H_OCode;
     unsigned H_Stack;
     unsigned H_Entry;
} ROF_Header;
```

Figure 1: Relocatable Object-Module Header

Before discussing why creating a library isn't that simple, let's examine the format of a relocatable object module to better understand the traps involved. Each relocatable object module contains, in order, the module header, module name, global symbol table, object code, initialized direct page data, initialized data, external symbol table, local symbol table and, optionally, a common block table.

```
struct
{
     unsigned Count;

     struct
     {
          char     *Name;
          char     Type;
          unsigned Offset;
     } Refs[Count];
} Globals;
```

Figure 2: Global Symbol Table

The format of the 24-byte module header is shown in Figure 1. The first four bytes are always $62CD2387 and are used for synchronization. The general idea is that if a library file becomes corrupted, it may be possible to recover most of the relocatable object modules by searching for the synchronization values. These synchronization values are also used to confirm that data within a file is actually a relocatable object module.

The next two bytes are the module's type, language, attributes and revision. The following byte is used to check the validity of the relocatable object module. A value of zero indicates the source code is assembled without any errors. If errors are detected by the assembler, a value of nonzero is stored in this byte. The next five bytes are the date and time the relocatable object module was created. The byte after that reflects the edition. This is followed by one byte that is reserved for future use.

The remaining data in the module header indicate the size of the unitialized data, unitialized direct page data, initialized data, initialized direct page data, object code, stack and, finally, the entry point in the module. Normally the type/language and entry point for a module is $0000, which means the module is a subroutine that is called by other modules. Only the relocatable object module that contains the entry point of the program defines the entry point and the type/language bytes. Immediately following the module header is a null-terminated string that defines the name of the relocatable object module.

```
struct
{
     unsigned Count1;

     struct
     {
          char     *Name;
          unsigned Count2;

          struct {
               char     Type;
               unsigned Offset;
          } Refs[Count2];
     } Symbols[Count1];
} Externals;
```

Figure 3: External Symbol Table

The first two bytes in the global symbol table indicate the number of global symbols contained in the table and is followed by this number of entries. Each entry in this table contains a null-terminated string defining the name of the symbol followed by a one-byte type and a two-byte offset. The symbol type defines whether the symbol is a variable (located in the data section) or a subroutine (located in the code section). The structure for the global symbol table is loosely defined in Figure 2. However, keep

In addition to being OS-9 Online SIGop, Greg Law enjoys programming on all types of computers and has worked on systems ranging from the CoCo to the Burroughs B6700 super mainframe. He lives in Louisville, Kentucky.

in mind that the structure shown is illegal C syntax due to the way in which the array is dimensioned.

A library is nothing more than several relocatable object modules merged into one file.

The next items up for bid are the object code, initialized direct page data and initialized data. The number of bytes in each of these sections is defined by H_OCode, H_DData and H_Data, respectively. The initialized direct page and initialized data sections contain the actual values that are copied into the data area at run time by either the cstart or root modules.

```
struct
{
     unsigned Count;

     struct
     {
          char     Type;
          unsigned Offset;
     } Refs[Count];
} Locals;
```

Figure 4: Local Symbol Table

The first two bytes in the external symbol table define the number of entries in the table and is followed by this number of entries. Each entry in this table contains a null-terminated string that defines the name of the external symbol and a two-byte value indicating the number of references to this symbol. A subtable follows this with one entry per reference that contains a one-byte reference type and a two-byte offset. The structure of the external symbol table is loosely defined in Figure 3. As with the global symbol table, the exact structure of the external symbol table cannot be legally represented so take these figures with a grain of salt.

The structure of the local symbol table (shown in Figure 4) is close to that of the external symbol table except there is no symbol name or a secondary count value.

The common block (shown in Figure 5) is perhaps the most difficult structure to handle. The most difficult aspect of the common block is that older versions of RMA (including c.asm bundled with the C compiler) do not generate the common block table. However, the version of RMA bundled with the *OS-9 Development System* always generates a common block table. By the same token, older versions of RLink (including c.link bundled with the C compiler) stop dead in their tracks and exit with an error if they encounter a common block table. Fortunately, the version of RLink bundled with the *OS-9 Development System* can handle relocatable object modules either with or without a common block table.

So, what's the difference between a global, an external and a local symbol? A global symbol is a symbol (either a function, subroutine or variable) that is defined within this relocatable object module. For example, if you compile a C source file that contains a qsort() function, qsort becomes a global symbol in the global symbol table. An external symbol is a symbol (either a function, subroutine or variable) that is referenced within this module, but is defined in another module. The local symbol table typically contains all of the static data defined within a C source file. Remember, a variable that is declared as static cannot be referenced by any module other than the one in which it is declared. The common block is used only by the Microware FORTRAN compiler, and for all intents and purposes is always blank — unless the module is generated by FORTRAN.

The Linker

Both the global and external symbol tables are extremely important to the linker. When several relocatable object modules are linked to form an executable program, the linker creates a table in memory of all external symbols found in each of the modules. The linker then searches the global symbol tables for each of the external symbols. When it finds a relocatable object module that contains a global symbol matching one of the external symbols, that module is merged onto the end of the executable program. So far, so good. Unfortunately, the linker does not search a library file more than once to resolve all external symbols, and it is possible to create a deadlock. Let's assume for a moment that we create three modules called exit.r, errmsg.r and abort.r. Let's also assume abort() calls errmsg() and errmsg() calls exit(). It is very important to remember that the linker searches the library file once and only once. For that reason, each external symbol must reference a global symbol that is located *after* this module. With that in mind, the three modules in our example should be in this order: abort.r, errmsg.r and exit.r. Use the key phrase "a calls b" to find the correct ordering of the modules. For example, abort() calls errmsg(), so abort.r (the module containing abort()) should be in the file *before* errmsg.r (the module containing errmsg()).

```
struct
{
     unsigned Count1;

     struct
     {
          char     *Name;
          unsigned Size;
          unsigned Count2;

          struct
          {
               char     Type;
               unsigned Offset;
          } Refs[Count2];
     } Blocks[Count1];
} Common_Block;
```

Figure 5: Common Block Table

Now, let's twist this scenario with a different set of modules. Again, assume we have three modules called a.r, b.r and c.r. Also assume that a() calls b(), b() calls c() and c() calls a(). This combination is referred to as a deadlock because modules a and c cannot be inserted into a library file in such a way as to satisfy both modules' requirements. However, you should realize that deadlocks are rare and often can be easily prevented. In this example, the easiest solution is to include both functions a() and c() in a single source file.

Another point to remember is that all functions contained within one C source file are compiled and assembled into a single relocatable object module. For example, assume you create a C source file called graphics.c that contains all of the text and graphics functions defined in the OS-9 Level II manual. When the C source file is compiled and assembled, a file called graphics.r is created. Now for the bad news: If you compile a program that calls *any* of the functions located in graphics.r, *all* of the functions within that module are linked into your program. For that reason, I don't recommend including large library routines in a single file. On the other hand, it is perfectly reasonable to include set and end pairs (DWSet and DWEnd, OWSet and OWEnd, etc.) in a single file. It is fairly safe to assume that most programs that call DWSet will also call DWEnd. The point to remember is that you really don't want all of your programs picking up a bunch of excess baggage.

The Assembly Line

CoCo Makes Waves

by William P. Nee

Consider a stone dropped into a pond, a beating heart or someone stirring his coffee. What do all these actions have in common? They produce waves that move in directions away from the disturbance and interact with whatever they touch. These waves might be electrical impulses along heart muscles, rust spreading on metal, or ripples on a pond. Using a principal developed by John Tyson of V.P.I., we'll simulate these waves of motion in a medium.

Whatever medium we use, we will consider it to be in an excited state, called U, or a recovery state, V. The variable used to reflect the U state can be one of two values: Zero indicates unexcited, and One means excited. The recovery-state variable may range between zero and V_{MAX}, which we will assume to be 100. When U is one, V may increase until it reaches V_{MAX} at which time U becomes zero. When U is zero, V decreases until it reaches zero. At this point (U=0, V=0), the medium is stable. As it changes, V increases by an amount we'll call G_{UP} and decreases by G_{DOWN}.

U=0 (Line 130):
— if V >= V_{EXC}, then V_{NEW} = V-GD: if V_{NEW} < 0, then V_{NEW} = 0: end
— if E > K_{EXC}, then U_{NEW} = 1: end
— if E <= K_{EXC}, then V_{NEW} = V-GD: if V_{NEW} < 0, then V_{NEW} = 0: end

U=1 (Line 200):
— if V <= V_{MAX}, then V_{NEW} = V+GU: if V_{NEW} > V_{MAX}, then V_{NEW} = V_{MAX}: end
— if V = V_{MAX}, then U_{NEW} = 0: end
— if EE > K_{REC}, then U_{NEW} = 0: end
— if EE <= K_{REC}, then V_{NEW} = V+GU: if V_{NEW} > V_{MAX}, then V_{NEW} = V_{MAX}: end

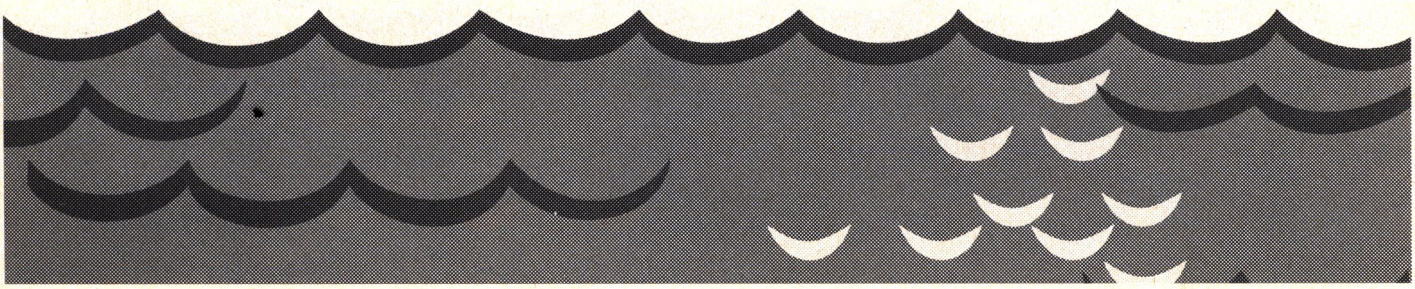
Figure 1: Rules for Listing 1

U, V, G_{UP} and G_{DOWN} are not the only factors involved — if they were, the medium would quickly settle down to a stable state and all wave action would stop. While our CoCo can't handle the numerous variables that affect wave motion, we can use a few to demonstrate a realistic simple wave. We'll use V_{EXC} to represent a sufficiently recovered V state value and V_{REC} to represent a sufficiently unexcited V state value.

As with any game of Life, the status of all points around a given point affect that point's new status. We need to check all of a point's neighbors to a distance of R. This includes all the points within a 2R+1 square centered on the desired point. We'll generally use a value of 3 for R, so we'll be looking at 49 points to determine each new value. The sum of all the excited cells (U=1) in a neighborhood is E, and the number of unexcited cells (EE) is given by 49-E.

The last two factors, K_{EXC} and K_{REC},

Bill Nee bucked the snowbird trend by retiring to Wisconsin from a banking career in Florida. The success of his 13-part series, "Machine Language Made BASIC" (July 1988 to July 1989), prompted him to continue writing articles about Color Computer machine-language programming. You may contact Bill at Route 2, Box 216C, Mason, WI 54856-9302, (715) 746-2952. Please include an SASE when requesting a reply.



represent the smallest values that allow the wave to keep moving. These values are usually less than R(2R+1). A cell whose U value is zero can become excited if the current V value is less than V_{EXC} and the number of excited cells in a neighborhood (E) is greater than K_{EXC}. Conversely, an excited cell can become unexcited (U=0) if V equals V_{MAX}, or if the number of unexcited cells in its neighborhood (EE) is greater than K_{REC} and V is between V_{REC} and V_{MAX}.

The Software

Listing 1 shows a BASIC program that demonstrates the effects of these factors. The area we'll look at is a 20-by-20 grid. Line 30 reads the variables; VM, which is V_{MAX}, is understood to be 100. Line 40 computes the size of the neighborhood. The demonstration fills the left half of the display area with an excitable (U=1) medium. The right half is still unexcited (U=0), and all V values are zero.

Starting with Line 90 are a series of loops that check all the cells within a square of R to 20-R for the current U and V values. A summary of the rules used is shown in Figure 1. Notice that there is only one way an unexcited state U can go from zero to one, but there are two ways an excited state can go from one to zero. This gradually dampens the initial disturbance, smoothing things just as in real life.

The last part of the BASIC program (Line 300) transfers the new U and V values back to the original arrays and, to demonstrate the results, plots the U values for all points. The subroutine at Line 350 computes the number of excited cells (U=1) within the neighborhood (E).

Run this program for a while and you can begin to see the wave spread out. Initially it may take a minute to compute just one new generation. Even though the E values are computed only when necessary, each of these computations takes 49 steps. It's going to take a machine-language program to demonstrate the simulation with any real speed.

A BASIC Driver

Before looking at the machine-langauge program, we need to make one refinement to the K values used. As an unexcited cell's V value gets closer to zero, fewer and fewer neighbors are needed to change the cell's U value to one. Conversely, as an excited cell's V value gets closer to V_{MAX}, more and more neighbors are needed to change its U value to zero. We'll reflect this by spreading the K values out in an array from zero to V_{MAX}, based on the formulas

$$K_{EXC(V)} = K_{EXC} + (R(2R+1) - K_{EXC}) * (V/V_{EXC})$$

$$K_{REC(V)} = \frac{K_{REC} + (R(2R+1) - K_{REC}) * (V_{MAX} - V)}{(V_{MAX} - V_{REC})}$$

Now the E value is compared to $K_{EXC(V)}$, and EE is compared to $K_{REC(V)}$. The BASIC driver (Listing 2) for the machine-language program incorporates these computations.

One other change needs to be considered: Computing those 49 values takes long enough when R is 3. Imagine how long it would take if we used a value of 5 or 6 for R. That would be 169 cells to evaluate! There is another procedure we can use, but it requires an additional array we'll call SUMS. Any point in this array, say S(I,J), equals the corresponding U value, U(I,J). When this array is filled, it takes only four values to compute E for each point (I,J). These four values are at the corners of a rectangle around the point at a distance of R. So E(I,J) equals S(I+R,J+R) + S(I-R-1,J-R-1) - S(I-R-1,J+R) - S(I+R,J-R-1). Now the number of steps necessary to compute E will not be dependent on the size of R. Of course the SUMS array must be modified at the beginning of each new generation. The BASIC driver computes the distance of those four corners, based on R, from the center cell in lines 160 through 190 and pokes them into their proper locations (lines 200 through 230).

Bits and Bytes

The machine-language program, WAVES, is shown in Listing 3. It uses a 104-by-96 grid and V_{MAX} equals 100. You define the other variables and set up the initial demonstration (half-full, one circle, two circles, etc) via options given in the BASIC driver. WAVES uses a PMODE 0 screen with reverse colors (black on white).

Three macros are defined initally: ZERO, PPOINT and LOCATE. ZERO clears the area from $3600 to $F900 where the arrays are stored. Since the area above $7FFF is being used, the interrupts must be enabled and $FFDF cleared.

PPOINT reads the entire display area to see what demo situation you have set up. If any point has been set (a zero, in reverse color) the corresponding locations in the OLDU and NEWU arrays are set to one.

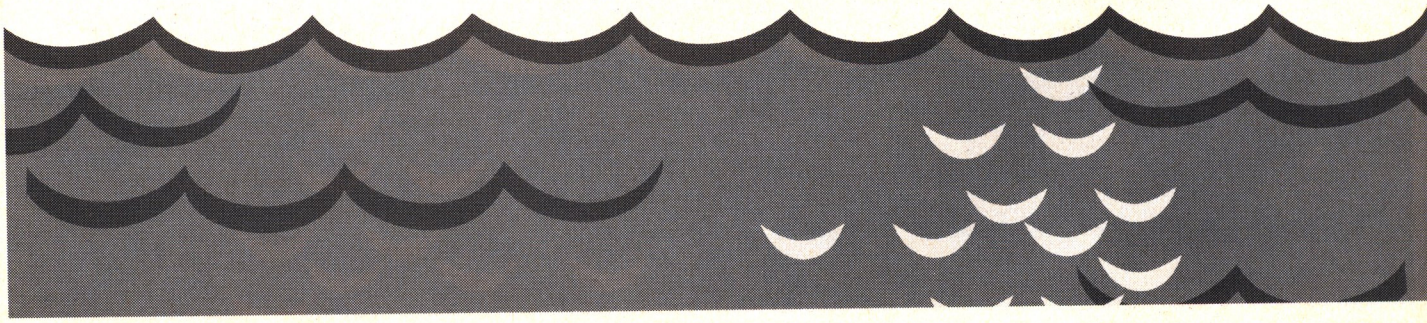
Based on the across and down values, LOCATE computes the current location within an array. Even though some of these macros are used only once, they make writing the program a lot quicker and also make the program easier to follow.

The CLEAR routine (Line 730) enables the interrupts, sets high RAM, and calls the ZERO macro. DEMO in Line 800 sets the DP register to $30 since the high byte of all variable locations is $30. This shortens the program as well as speeds it up. The PPOINT macro then transfers your data for the situation you choose to Array OLDU.

Actual computations begin at START (Line 870) with Location OLDU(1,1). The LOCATE macro computes the actual location within the array, and the current U value and three SUMS values are combined for the current SUMS value. NEXT begins at OLDU(R+1,R+1) and transfers the current U and V values to the arrays NEWU and NEWV. Then the Rules check begins.

If U equals one, the program branches to TEST1. If not, the current V value is compared to VEXC. If the V value is greater than or equal to VEXC, the program branches to TESTOA at Line 1630. If not, the number of excited cells (E) in the neighborhood is computed and compared to the corresponding V value in Array KEXC. If E is greater, the value in NEWU is set to one. If not, the program branches to Line 1630. Routine TESTOA subtracts GDOWN from the current V value and stores the result or zero, whichever is greater, in NEWV.

TEST1 (Line 1690) compares the current V value to VREC. If it's equal to or less than VREC, the program branches to TEST1A. If the V value equals VMAX, NEWU is set to zero. If not, the E value is computed and subtracted from RR to get EE. This is then compared to the corresponding V value in Array KREC. If it's lower, the program branches to TEST1A. Otherwise NEWU is set



to zero. TEST1A adds GUP to the current value of V and stores the result or VMAX, whichever is less, in NEWV.

These computations are carried out until ACROSS reaches LENGTH - R and DOWN reaches WIDTH - R. QSHOW (Line 2160) transfers the NEWU and NEWV values to OLDU and OLDV, and displays the result. Rather than PSET each point on the screen, the U data is transferred eight bits at a time to TOTAL, which is then poked into the proper graphics locations. Notice in Line 2260 that TOTAL is shifted left before storing the U value. This keeps Bit 7 from being bumped out after the eighth shift. The COMA in Line 2360 reverses the value of each bit before poking it into graphics memory since we're using reverse colors. Because the program branches immediately back to START, the only way to stop execution is by pressing the Reset button. Once you've entered and debugged the program, save the source code with W WAVES.ASM and assemble it with A WAVES.BIN /NS/WE.

The BASIC driver for this program (Listing 2) sets the screen to PMODE 0,1, clears space for and loads, if necessary, the machine-language program. All the required data, including the KREC and KEXC arrays are poked into their locations. Line 240 executes the ZERO macro, clearing space for the U and V values. Lines 270 through 310 are different demos you can try, or you can add your own. Remember that the graphics start three bytes to the right, and all *x* and *y* coordinates must be doubled for PMODE 0. The DATA statements in lines 330 through 390 are various values for the variables used. If you try your own data, follow these guidelines:

$$0 < G_{UP} < 100$$

$$0 < G_{DOWN} < 100$$

$$0 < V_{EXC} < V_{REC} < 100$$

$$0 <= K_{EXC} <= R(2R+1)$$

$$0 < K_{REC} <= R(2R+1)$$

You may have to adjust K_{REC} to keep all values of $K_{REC(V)}$ greater than zero and less than 255 since there is only one byte of data reserved for each of them. After you've entered the BASIC driver, save it as WAVES2.BAS.

Some changes you might like to try include:

1) coloring the V values instead of U

2) increasing the size of the display. You'll probably have to combine the U and V values into one array by making U=0 a positive number and U=1 a negative number (Bit 7 cleared or set).

Whatever changes you make, I hope you enjoy creating waves. In the next article we'll investigate some of the rules of Life. If you have any suggestions for future articles, please don't hesitate to write. ❑

64K Disk

Listing 1: WAVES1

```
10 L=20:VM=100
20 DIM U(L,L),UU(L,L),V(L,L),VV(
L,L)
30 READ R,VR,VE,GU,GD,KR,KE
40 RR=(2*R+1)*(2*R+1)
50 PMODE0,1:PCLS:SCREEN1,1
60 FOR Y=0 TO L:FOR X=0 TO L/2
70 U(X,Y)=1:UU(X,Y)=1
80 PSET(X+X,Y+Y):NEXT X,Y
90 FOR X=R TO L-R:FOR Y=R TO L-R
100 U=U(X,Y):UU(X,Y)=U
110 V=V(X,Y):VV(X,Y)=V
120 IF U=1 THEN 200
130 'TEST 0
140 IF V=>VE THEN 180
150 GOSUB 350
160 IF E>KE THEN UU(X,Y)=1:GOTO
 290
170 'TEST 0A
180 V=V-GD:IF V<0 THEN V=0
190 VV(X,Y)=V:GOTO 290
200 'TEST 1
210 IF V<=VR THEN 260
220 IF V=VM THEN UU(X,Y)=0:GOTO
 290
230 GOSUB 350
240 EE=RR-E
250 IF EE>KR THEN UU(X,Y)=0:GOTO
 290
260 'TEST 1A
270 V=V+GU:IF V>VM THEN V=VM
280 VV(X,Y)=V
290 NEXT Y,X
300 FOR X=0 TO L:FOR Y=0 TO L
310 U=UU(X,Y):U(X,Y)=U
320 V=VV(X,Y):V(X,Y)=V
330 PSET(X+X,Y+Y,U)
340 NEXT Y,X:GOTO 90
350 E=0
360 FOR I=X-R TO X+R
370 FOR J=Y-R TO Y+R
380 IF U(I,J)=1 THEN E=E+1
390 NEXT J,I:RETURN
400 DATA 3,95,80,24,19,9,5
```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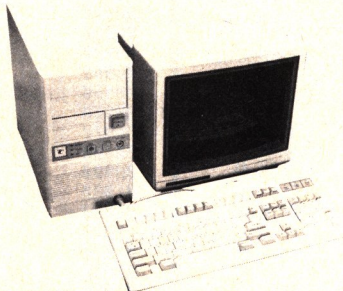

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Listing 2: WAVES2

```
10 PMODE0,1:PCLEAR1:CLS
20 CLEAR 200,&H3000-1
30 IF PEEK(&H30DD)<>26 THEN LOAD
M"WAVES":POKE&HFF40,0
40 PRINT@203,"COMPUTING"
50 K0=&H3013:K1=&H3078
60 READ R,VR,VE,GU,GD,KR,KE
70 VM=100
80 SZ=104
90 POKE&H3000,VM:POKE&H3001,VR:P
OKE&H3002,VE
100 POKE&H3003,GU:POKE&H3004,GD
110 POKE&H3005,SZ:POKE&H3006,R:R
R=(2*R+1)*(2*R+1):R1=R*(2*R+1):P
OKE&H3007,RR
120 POKE &H3011,103-R:POKE &H301
2,95-R
130 FOR V=0 TO VM:K=KE+(R1-KE)*(
V/VE):POKE K0+V,INT(K)
140 K=KR+(R1-KR)*(VM-V)/(VM-VR)
150 POKE K1+V,INT(K):NEXT
160 E1=R*(SZ+1)
170 E2=-(R+1)*(SZ+1):E2=&HFFFF+E
2+1
180 E3=R*(SZ-1)-1
190 E4=R-SZ*(R+1):E4=&HFFFF+E4+1
200 HI=INT(E1/256):LO=E1-256*HI:
POKE &H31AA,HI:POKE &H31AB,LO:PO
KE &H31FE,HI:POKE &H31FF,LO
210 HI=INT(E2/256):LO=E2-256*HI:
POKE &H31B0,HI:POKE &H31B1,LO:PO
KE &H3204,HI:POKE &H3205,LO
220 HI=INT(E3/256):LO=E3-256*HI:
POKE &H31B8,HI:POKE &H31B9,LO:PO
KE &H320C,HI:POKE &H320D,LO
230 HI=INT(E4/256):LO=E4-256*HI:
POKE &H31C1,HI:POKE &H31C2,LO:PO
KE &H3215,HI:POKE &H3216,LO
240 EXEC &H30DD
250 'YOUR DEMO
260 PMODE0,1:COLOR0,5:PCLS:SCREE
N1,1
270 LINE(32,0)-(136,190),PSET,BF
280 'LINE(32,0)-(240,190),PSET,B
F
290 'LINE(32,0)-(128,64),PSET,BF
:LINE(32,128)-(128,190),PSET,BF
300 'CIRCLE(38,96),4*R:PAINT(38,
96),0,0
310 'CIRCLE(38,64),4*R:PAINT(38,
64),0,0:CIRCLE(38,128),4*R:PAINT
(38,128),0,0
320 EXEC &H30F3
330 DATA 3,85,80,24,19,7,5
340 'DATA 2,85,80,24,19,7,5
350 'DATA 3,70,65,20,5,5,0
360 'DATA 3,90,85,25,20,7,5
370 'DATA 3,90,85,20,5,5,0
380 'DATA 6,82,71,12,5,53,0
390 'DATA 3,82,71,12,5,25,0
```

Listing 3: WAVES.ASM

```
00100 * RECOVERY 104X96 *
00110 PPOINT  MACRO
00120         LDU     #OLDU
00130         LDX     $BA
00140         LEAX    2,X     DISPLAY IS 3 BYTES OVER
00150         LDB     #96
00160         STB     DOWN
00170 \.D     LDA     #13
00180         STA     ACROSS
00190 \.C     LDA     ,X+
00200         LDB     #8
00210 \.B     LSLA
00220         BCS     \.A     REVERSED COLORS (0=PSET)
00230         INC     ,U      OLDU=1
00240         INC     $2700,U NEWU=1
00250 \.A     LEAU    1,U
00260         DECB
00270         BNE     \.B
00280         DEC     ACROSS
00290         BNE     \.C
00300         LEAX    3,X     NEXT ROW, 3 BYTES OVER
00310         DEC     DOWN
00320         BNE     \.D
00330         ENDM
00340
00350 ZERO    MACRO
00360         LDU     #$3600  START OF OLDU
00370 \.A     CLR     ,U+
00380         CMPU    #$F900  END OF SUMS
00390         BNE     \.A
00400         ENDM
00410
00420 LOCATE MACRO
00430         LDA     \1
00440         LDB     \2
00450         MUL
00460         ADDB    \0
00470         ADCA    #0
00480         ENDM
00490
00500         ORG     $3000
00510 VMAX    RMB     1
00520 VREC    RMB     1
00530 VEXC    RMB     1
00540 GUP     RMB     1
00550 GDOWN   RMB     1
00560 SIZE    RMB     1
00570 R       RMB     1
00580 RR      RMB     1
00590 E       RMB     1
00600 EE      RMB     1
00610 UU      RMB     1
00620 VV      RMB     1
00630 TOTAL   RMB     1
00640 ACROSS  RMB     1
00650 DOWN    RMB     1
00660 X1      RMB     1
00670 Y1      RMB     1
00680 XR      RMB     1
00690 YR      RMB     1
00700 K0      RMB     101     KEXC ARRAY (0 - 100)
00710 K1      RMB     101     KREC ARRAY (0 - 100)
00720
00730 CLEAR   ORCC    #$50    ENABLE INTERRUPTS
00740         CLR     $FFDF   HIGH RAM
00750         ZERO
00760         CLR     $FFDE   LOW RAM
00770         ANDCC   #$AF
00780         RTS
00790
00800 DEMO    ORCC    #$50
00810         CLR     $FFDF
00820         SETDP   $30     VARIABLES BEGIN WITH $30--
00830         LDA     #$30
00840         TFR     A,DP
00850         PPOINT
00860
00870 START   LDU     #OLDU
00880         LDA     #1
00890 L1      STA     DOWN
00900         LDB     #1
00910 L2      STB     ACROSS  START AT U(1,1)
00920         LDY     #SUMS
00930         LOCATE  ACROSS,DOWN,SIZE
00940         LEAY    D,Y
00950         LDA     D,U
00960         STA     TOTAL
00970         LDA     -1,Y    S(I-1,J)
00980         ADDA    TOTAL
00990         STA     TOTAL
01000         LDA     -104,Y  S(I,J-1)
01010         ADDA    TOTAL
01020         STA     TOTAL
01030         LDA     -105,Y  S(I-1,J-1)
01040         NEGA
01050         ADDA    TOTAL
01060         STA     ,Y
01070         LDB     ACROSS
01080         INCB
01090         CMPB    #103
01100         BLS     L2
01110         LDA     DOWN
01120         INCA
01130         CMPA    #95
01140         BLS     L1
01150
01160 NEXT    LDA     R
01170         INCA
01180 L3      STA     DOWN
01190         LDB     R
01200         INCB            START AT U(R+1,R+1)
01210 L4      STB     ACROSS
01220         LOCATE  ACROSS,DOWN,SIZE
01230         LDU     #OLDU
01240         LDX     #OLDV
01250         LDY     #SUMS
01260         LEAU    D,U
01270         LEAX    D,X
01280         LEAY    D,Y
```

```
01290          LDA     ,U      GET CURRENT U VALUE
01300          STA     UU      SAVE IT
01310          STA     $2700,U
01320          LDB     ,X      GET CURRENT V VALUE
01330          STB     VV      SAVE IT
01340          STB     $2700,X
01350          TST     UU      U=0 ?
01360          LBNE    TEST1
01370
01380 TEST0    LDA     VV
01390          CMPA    VEXC    V=>VEXC ?
01400          BHS     TEST0A
01410          LDA     315,Y   S(I+R,J+R)
01420          STA     TOTAL
01430          LDA     -420,Y  S(I-R-1,J-R-1)
01440          ADDA    TOTAL
01450          STA     TOTAL
01460          LDA     308,Y   S(I-R-1,J+R)
01470          NEGA
01480          ADDA    TOTAL
01490          STA     TOTAL
01500          LDA     -413,Y  S(I+R,J-R-1)
01510          NEGA
01520          ADDA    TOTAL
01530          STA     E
01540          LDA     VV
01550          LDB     E
01560          LDY     #K0
01570          CMPB    A,Y     E>KEXC(V) ?
01580          BLS     TEST0A
01590          LDA     #1
01600          STA     $2700,U NEWU=1
01610          LBRA    DONE
01620
01630 TEST0A   SUBA    GDOWN   NEWV=V-GDOWN
01640          BPL     TST0A1
01650          CLRA
01660 TST0A1   STA     $2700,X
01670          LBRA    DONE
01680
01690 TEST1    LDA     VV
01700          CMPA    VREC    V<=VREC ?
01710          LBLS    TEST1A
01720          CMPA    VMAX    V=VMAX ?
01730          BNE     TEST11
01740          CLR     $2700,U
01750          LBRA    DONE
01760
01770 TEST11   LDA     315,Y
01780          STA     TOTAL
01790          LDA     -420,Y
01800          ADDA    TOTAL
01810          STA     TOTAL
01820          LDA     308,Y
01830          NEGA
01840          ADDA    TOTAL
01850          STA     TOTAL
01860          LDA     -413,Y
01870          NEGA
01880          ADDA    TOTAL
01890          STA     E
01900          LDB     RR
01910          SUBB    E
01920          STB     EE
01930          LDA     VV
01940          LDB     EE
01950          LDY     #K1
01960          CMPB    A,Y     EE>KREC(V) ?
01970          BLS     TEST1A
01980          CLR     $2700,U
01990          BRA     DONE
02000
02010 TEST1A   ADDA    GUP     NEWV=V+GUP
02020          CMPA    VMAX
02030          BLS     TST1A1
02040          LDA     VMAX
02050 TST1A1   STA     $2700,X
02060
02070 DONE     LDB     ACROSS
02080          INCB
02090          CMPB    XR      LENGTH-R
02100          LBLS    L4
02110          LDA     DOWN
02120          INCA
02130          CMPA    YR      WIDTH-R
02140          LBLS    L3
02150
02160 QSHOW    LDU     #OLDU
02170          LDY     #SUMS
02180          LDX     $BA
02190          LEAX    2,X     DISPLAY STARTS 3 BYTES OVER
02200          LDA     #96     #ROWS DOWN (0 - 95)
02210          STA     DOWN
02220 Q3       LDB     #13     # BYTES ACROSS (104/8)
02230          STB     ACROSS
02240 Q2       CLR     TOTAL
02250          LDB     #8      # BITS PER BYTE
02260 Q1       LSL     TOTAL
02270          CLR     ,Y+     CLEAR SUMS
02280          LDA     $7500,U NEW V
02290          STA     $4E00,U OLD V
02300          LDA     $2700,U NEWU
02310          STA     ,U+     OLDU
02320          ADDA    TOTAL
02330          STA     TOTAL   SAVE U VALUES
02340          DECB
02350          BNE     Q1
02360          COMA            REVERSE THEM
02370          STA     ,X+      AND DISPLAY THEM
02380          DEC     ACROSS
02390          BNE     Q2
02400          LEAX    3,X
02410          DEC     DOWN
02420          BNE     Q3
02430          LBRA    START
02440
02450 OLDU     EQU     $3600
02460 NEWU     EQU     $5D00
02470 OLDV     EQU     $8400
02480 NEWV     EQU     $AB00
02490 SUMS     EQU     $D300
02500 FINIS    *
02510          END     DEMO
```


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An enhanced OS-9 display command that accepts decimals

Easy Display

by Stephen B. Goldberg

A useful feature of OS-9 is the inclusion of commands that give users the ability to quickly change characteristics of the operating system. One example is the `tmode` command, which is used to change terminal baud, the number of lines on the screen, and much more. Another example is `display`.

The `display` command is an OS-9 utility that converts numbers, entered as parameters on the command line, to ASCII characters and sends them to the appropriate output path. It is generally used to send control codes to the screen, which is the *standard output path*. For example, the accepted ASCII code for a form feed is 12 or $0C. To clear the screen, you would enter `display c`. With OS-9's output-path redirection, you could enter `display c >/p` to tell the printer to eject a blank page. (For more display codes, consult your OS-9 documentation and also "KISSable OS-9," October 1990, Page 58.)

Unfortunately, though, the `display` command is designed to accept numbers in hexadecimal form only. If you entered the decimal number 12 with `display`, OS-9 would not clear the screen. This would not be a problem except that it makes more sense to enter the decimal values 80 and 24 to define an 80-column window rather than using $50 and $18. I used to keep a pencil and some paper next to my CoCo for the purpose of manually converting decimal values to Hex for use with `display`. Others use fancy calculators that handle the conversion for them. We don't have to do this any more.

Listing 1 is the assembly-language source code for a new `display` command that solves the problem. My version of `display` functions the same as the stock command when used with hexadecimal parameters — just enter them as you nor-

Stephen Goldberg is a dentist and the author of the Utilipak *series of OS-9 utilities. He can be contacted at 695 Plainview Road, Bethpage, NY 11714. Please include an SASE when requesting a reply.*

OS-9

Listing 1: `Display.asm`

```
*******************************************************
*
* DISPLAY  -  (c) 1988 by S. B. GOLDBERG
*
* Display utility using decimal or hex format
*
* Use: display <[(]number[)]> [...]
*
         ifp1
         use   /dd/defs/os9defs
         endc
*
         mod   len,name,prgrm+objct,reent+1,entry,dsiz
*
char     rmb   1              character buffer
dcount   rmb   1              digit count
         rmb   200            stack
         rmb   200            parameters
dsiz     equ   .
```

mally would. However, it also accepts numbers entered in decimal notation, which is faster for many people because it's more familiar; we work with decimal numbers every day.

To tell my version of `display` you are using decimal numbers, enclose them in parentheses. The opening parenthesis, (, tells `display` the numbers following are in decimal form. The closing parenthesis,), indicates that decimal notation has ended and hexadecimal notation has resumed. Both Hex and decimal may be mixed on the command line. You need only make sure any group of one or more decimal parameters are enclosed in parentheses.

```
*
name     fcs   /Display/
         fcb   2              edition number
         fcc   /(c)1988 S.B.Goldberg/
*******************************
* CONVERT HEX TO BINARY
*******************************
hextobin leax  -1,x           reset parameter pointer
         clrb                 zero value
         clr   dcount         zero digit count
         bsr   hexcalc        convert hex digit
hexcalc  lda   ,x             get character
         cmpa  #'0            valid hex digit?
         blo   back           no, end conversion
         cmpa  #'9            valid digit?
         bls   makebin        yes, convert to binary
         anda  #$df           alpha digit to upper case
         cmpa  #'A            valid hex digit?
         blo   back           no, end conversion
         cmpa  #'F            valid digit?
         bhi   back           no, end conversion
         suba  #7             make alpha digit correct value
makebin  suba  #'0            convert digit to binary
         pshs  a              save current digit
         lda   #16            multiply old
         mul                  total by 16
         addb  ,s+            add current digit
         leax  1,x            bump parameter pointer
         inc   dcount         count digit
back     rts                  return
*******************************
* PROCESS HEX PARAMETERS
*******************************
entry    lda   ,x+            parameter character
         cmpa  #$20           space?
         beq   entry          yes, look some more
         cmpa  #'(            decimal?
         beq   decloop        yes, do decimal parameters
         cmpa  #')            continue hex?
         beq   entry          yes, get next character
         bsr   hextobin       convert hex to binary
         tst   dcount         hex digits?
         beq   noerr          no, quit display
         stb   ,u             yes, save character
         bsr   print          print character
         bra   entry          check for another parameter
*******************************
* CHARACTER TO STANDARD OUTPUT
*******************************
print    pshs  x              save parameter pointer
         tfr   u,x            character buffer
         ldy   #1             one character only
         lda   #1             standard output path
         os9   i$write        character to screen
         bcs   out            exit with error
         puls  x,pc           retrieve pointer and return
*
noerr    clrb                 clear error flag
out      os9   f$exit         quit
*******************************
* PROCESS DECIMAL PARAMETERS
*******************************
decloop  lda   ,x+            get character
         cmpa  #$20           space?
         beq   decloop        yes, look again
         cmpa  #')            end of decimal parameters?
```

Let's look at an example of how the new `display` can be used with windows. A typical command to create a device window is

```
display 1b 20 2 0 0 50 18 1 0 4
```

With the new `display`, you could enter

```
display 1b 20 2 0 0 (80 24) 1 0 4
```

You don't have to convert decimal numbers to Hex any more for use with display.

The first code, `1b 20`, is the Level II escape code for creating a device window. The next three codes define the window type and starting location. The sixth and seventh parameters define the size of the window in columns and rows. The final three numbers indicate the screen colors. Notice that using decimal values with `display` makes it immediately clear what size window is being defined. If you wanted, you could use decimal numbers only, as long as the entire group is enclosed in parentheses.

For those who do not have an assembler, I have included a BASIC09 procedure (Listing 2) that generates the `display` module and saves it in the `/dd/CMDS` directory. If you are using OS-9 Level I, use the BASIC09 procedure to create `display`, and change `/dd` at offsets $007B and $00C8 to `/d0`. Before assembling Listing 1 or running Listing 2, make sure you rename your existing `display` command. You can do this by changing your current data directory to `/dd/CMDS` (using `chd`) and entering

```
rename display display.old
```

This `display` utility has made using control codes with the screen and printer much more straightforward. I hope it simplifies the way you use OS-9, too. ❑

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```
          beq   entry          yes, continue with hex
          cmpa  #'(            continue decimal?
          beq   decloop        yes, get next character
          bsr   dectobin       make decimal binary
          tst   dcount         decimal digits?
          beq   noerr          no, quit display
          bsr   print          yes, print character
          bra   decloop        look for another parameter
*****************************
* CONVERT DECIMAL TO BINARY
*****************************
dectobin  leax  -1,x           reset parameter pointer
          clrb                 zero value
          clr   dcount         zero digit count
          bsr   deccalc        convert first digit .
          bsr   deccalc        next 2 digits
deccalc   lda   ,x             get character
          suba  #'0            make binary
          cmpa  #9             valid decimal digit?
          bhi   back2          no, end conversion
          pshs  a              yes, save current digit
          lda   #10            multiply previous
          mul                  total by 10
          addb  ,s+            add current digit
          adca  #0             more than 255?
          bne   back2          yes, end conversion
          stb   ,u             no, save new total
          leax  1,x            bump parameter pointer
          inc   dcount         count digit
back2     rts                  return
*
          emod
len       equ   *
          end
```

Listing 2: MakeDisplay.b09

```
PROCEDURE MakeDisplay
 0000       (* Generates the binary module display *)
 0029       (* Level I - change all /dd to /d0 *)
 004E       DIM path,byt:BYTE
 0059       DIM count:INTEGER
 0060       PRINT "Creating display . . .";
 007B       CREATE #path,"/dd/cmds/display":WRITE
 0096       FOR count=1 TO 193
 00A6         READ byt
 00AB         PUT #path,byt
 00B5       NEXT count
 00C0       CLOSE #path
 00C6       PRINT
 00C8       SHELL "attr /dd/cmds/display e pe"
 00E6       END
 00E8       DATA 135,205,0,193,0,13,17,129,233,0,84,1,146,68,105
 0119       DATA 115,112,108,97,249,2,40,99,41,49,57,56,56,32,83
 014A       DATA 46,66,46,71,111,108,100,98,101,114,103,48,31,95
 0178       DATA 15,1,141,0,166,132,129,48,37,29,129,57,35,12,132
 01A9       DATA 223,129,65,37,19,129,70,34,15,128,7,128,48,52
 01D7       DATA 2,134,16,61,235,224,48,1,12,1,57,166,128,129,32
 0208       DATA 39,250,129,40,39,37,129,41,39,242,141,197,13,1
 0236       DATA 39,23,231,196,141,2,32,230,52,16,31,49,16,142
 0264       DATA 0,1,134,1,16,63,138,37,3,53,144,95,16,63,6,166
 0298       DATA 128,129,32,39,250,129,41,39,199,129,40,39,242
 02C3       DATA 141,8,13,1,39,232,141,213,32,232,48,31,95,15,1
 02F4       DATA 141,2,141,0,166,132,128,48,129,9,34,17,52,2,134
 0325       DATA 10,61,235,224,137,0,38,6,231,196,48,1,12,1,57
 0356       DATA 35,210,80
```

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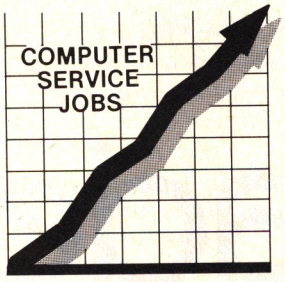

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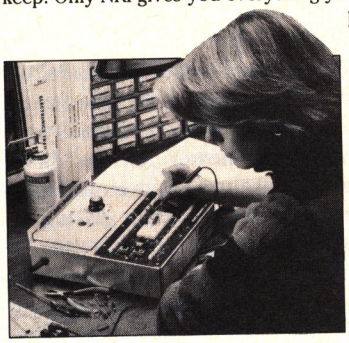

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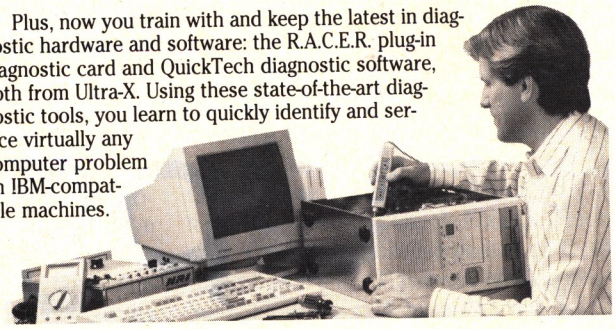

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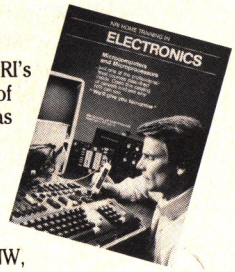

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The definitive word on using the MPI with the CoCo 3

Upgrade Your Multi-Pak

by Marty Goodman

Over the last few years in feature articles and columns in THE RAINBOW, and in many replies on Delphi's CoCo SIG, I've commented on the need and the means for upgrading the Multi-Pak Interface (MPI) for use with the CoCo 3. However, until a few weeks ago I never had a clear understanding of exactly why the Multi-Pak upgrade is necessary. This was reflected in my somewhat waffling approach to questions about whether unupgraded Multi-Paks that appeared to work properly with the CoCo 3 should be upgraded. Another question was whether failure to perform the upgrade could injure either the CoCo 3 or the MPI itself.

A few weeks ago I was asked to consult with a major Color Computer vendor regarding a proposed new CoCo product: A buffered Y cable for the CoCo 3. In the course of looking over the design and making some suggestions for improving it prior to production, I had to increase my understanding of just what the upgrades did for the Tandy Multi-Pak Interface. As a result, I can now provide more-definitive information to other CoCo users.

Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator — sort of the Howard Cosell of the CoCo world. On Delphi, Marty is the SIGop of RAINBOW's CoCo SIG. His non-computer passions include running, mountaineering and outdoor photography. Marty lives in San Pablo, California.

The Bottom Line

The very earliest of Tandy Multi-Paks (those with Catalog Number 26-3024 that were in gray plastic cases) simply do not work with a CoCo 3 without the upgrade. If you put a disk controller into Slot 4 and plug the MPI into a CoCo 3, you will not even get the Disk Extended BASIC message when you power up the system. Instead, you get the Extended BASIC message.

The oldest release of the MPI had its slot-select address *ghost* from its official location at $FF7F to Location $FF9F — any attempt to write data to $FF9F affects which Multi-Pak slot is selected. The ghosting to $FF9F was never a problem with the CoCo 1 and 2. Those models of the Color Computer did not use that address internally, and developers of add-on cards knew to stay away from Location $FF9F in the I/O address space when designing CoCo hardware. However, the GIME chip in the CoCo 3 uses address $FF9F as part of its horizontal-offset register for video.

When the CoCo 3 powers up, it initializes all the GIME chip registers, including the one at $FF9F. The attempt to initialize this register causes the older MPI to switch away from Slot 4 where the disk controller resides. Any subsequent writes to the horizontal-offset register of the GIME chip further messes with the Multi-Pak's slot selection. Thus, owners of the earliest models of MPI from Tandy quickly found they absolutely had to upgrade their Multi-Paks. This is done by replacing the socketed PAL chip with a newer, specially designed PAL.

Some of the newer 26-3024 Multi-Pak Interfaces (those in a white case) and all of the (smaller) 26-3124 MPIs do not ghost Address $FF7F to Address $FF9F. When connected to a CoCo 3, with the disk controller in Slot 4, these units appear to work properly. The question, then, is should these units be upgraded? The answer is simple — *yes! All Multi-Paks being used with the CoCo 3 should be upgraded.*

Why Must We Upgrade?

The Multi-Pak Interface from Tandy buffers all address and data lines on the Color Computer system bus. Since address lines carry data in only one direction (from the 6809 to the rest of the system), buffering them presents no problem. However, data lines are bidirectional and therefore require a buffer that operates in both directions.

The data buffer used on the data lines in the MPI is connected to a control line called the R/W (Read/Write) line, which tells the data buffer (a 74LS245 chip) which direction the data is supposed to go. Both the Color Computer 3 and the Multi-Pak Interface have such data buffers.

As long as you do not use hardware cards that have ports in the I/O address space now reserved for the GIME chip, no problems arise with an unupgraded MPI during attempts by the 6809 to *write* data. However, problems do occur when using a Multi-Pak (even one with no cards in it) if the 6809

attempts to *read* data from ports of the GIME chip in the range $FF80 through $FFBF. The reason is simple: Multi-Paks have never heard of a GIME chip, and they assume the address space in the range $FF80 through $FFBF is available for general-purpose I/O. Thus, they allow their data buffer to be active when a read operation is performed by the 6809 in that address range. The result is that attempts to read the contents of GIME chip registers can get garbled because both the GIME chip and the 74LS245 data buffer in the Multi-Pak are trying to place data on the 6809's system bus at the same time. It doesn't matter that there may be no device in the MPI addressed in that range — the 74LS245 buffer in the Multi-Pak remains active, putting random garbage data onto the data lines, which conflicts with the valid data the GIME chip is trying to send to the 6809.

The upgrade involves altering control over the 74LS245 data buffer in the Multi-Pak so that it is effectively taken out of the circuit preventing both read and write operations with the $FF80-$FFBF address range reserved for the Multi-Pak. Technically knowledgeable types will know that this means putting the 74LS245 into the *tri-state* mode, with all its pins at a high impedance level. Note that the data buffer in all models of the MPI is already tri-stated for all 6809 addresses except those decoded by the *CTS select ($C000 through $FFDF), the *SCS address space ($FF40 through $FF5F), and the general-purpose I/O address space of $FF60 through $FFBF. The upgrade narrows the valid general-purpose I/O range from $FF60 through $FFBF to $FF60 through $FF7F, which excludes the address range reserved for the GIME chip in the CoCo 3.

Using unupgraded Multi-Paks that appear to work correctly with the CoCo 3 can result in problems with any software that attempts to read registers in the MPI. Happily, I can assure you that although you may run into some subtle flakiness in CoCo 3 performance, using an unupgraded Multi-Pak will not in any way injure either the CoCo 3 or the MPI. The brief data conflicts between the 74LS245 buffers in the CoCo 3 and the Multi-Pak *will not* physically damage either buffer chip or any other chips in either device.

The Upgrade

The actual upgrade is achieved in one of two different ways, depending on whether you have a 26-3024 or 26-3124 MPI. If you have the older (26-3024) Multi-Pak, you first buy a new 20-pin PAL chip (available from Tandy National Parts, CoCo PRO! and Microcom). Then open the MPI, remove the old PAL (it is the only socketed chip) and replace it with the new PAL.

The upgrade required for the 26-3124 Multi-Pak is a little more difficult. Instead of simply replacing a chip, you must patch the data-buffer-enable circuitry by cutting a couple of traces and adding a specially prepared 74LS10 chip. The exact circuit for this upgrade was presented in a previous RAINBOW article ("Quick Fixes," October 1988, Page 58) and is also posted on Delphi in the CoCo SIG's Hardware Hacking database. However, I'll give you a quick description of the upgrade here (see sidebar). If you encounter problems, refer to the RAINBOW article or to the schematic posted on Delphi.

Related Topics

One final tip on the subject of CoCo 3's, data buffers, and the MPI: OS-9 users who want to decrease the chance that subtle timing differences will cause problems, and who are experienced hardware hackers, might want to consider replacing the 74LS245 chips in the CoCo 3 and the MPI. (There is only one 74LS245 in either unit. The one in the CoCo 3 is labeled IC3 and is located right next to the 68B09E.) In the past, I have recommended people use 74F245s as replacements. However, Bruce Isted has informed me these chips may or may not work properly. Instead, replace the 74LS245s with 74AS245s, 74LS645s or 74ALS645s. (For more information, see this month's "CoCo Consultations.") To do this, desolder the existing 74LS245s, install sockets and plug in the new chips.

Those who do not have a Multi-Pak Interface, but need one to simultaneously operate a disk controller and other cards, have several alternatives:

1) In the CoCo and OS9 Online SIGs on Delphi are classified-ads sections where many used Color Computer items are offered. Multi-Paks are often among those items.

2) Howard Medical sells the Slot Pak III, a Multi-Pak-like device.

3) Many RAINBOW vendors sell Y cables, which will do for simple situations, such as one disk controller and one RS-232 Pak.

4) CoCo PRO! may soon offer a buffered Y cable (which was the impetus for my writing this article in the first place).

Happy Hacking! See you all on the Delphi CoCo and OS9 Online SIGs.

Upgrading the 26-3124 MPI

To upgrade the newer 26-3124 Multi-Paks for operation with a CoCo 3 requires that you construct and install a small satellite circuit board.

Construction:

1) Mount a 74LS10 (or 74F10) chip on a small circuit board.

2) Connect a 6-inch length of red wire to V_{CC} (Pin 14).

3) Connect a 6-inch length of black wire to the Ground pin. (Pin 7).

4) Wire a .1 µFd capacitor between pins 7 and 14.

5) Connect pins 1, 2 and 3 together, and connect this to one side of a 1000-ohm, 1/4-watt resistor.

6) Connect the other side of the resistor to Pin 14 (V_{CC}).

7) Connect Pin 12 to Pin 4 of the chip.

8) Connect Pin 8 to Pin 5.

9) Connect 6-inch lengths of wire to pins 6, 9, 10, 11 and 13 of the 74LS10.

Installation:

1) Cut the trace that joins Pin 52 of IC6 with Pin 19 of IC1 on the MPI motherboard.

2) Connect Pin 6 of the 74LS10 to Pin 19 of IC1.

3) Connect Pin 13 of the 74LS10 to Pin 52 of IC6.

4) Connect Pin 9 of the 74LS10 to Pin 11 of IC4.

5) Connect Pin 10 of the 74LS10 to Pin 9 of IC4.

6) Connect Pin 11 of the 74LS10 to Pin 3 of IC4.

7) Connect the red V_{CC} wire from the 74LS10 to a source of +5 volts, such as Pin 16 of IC5.

8) Connect the black Ground wire to ground on the Multi-Pak motherboard. Pin 8 of IC5 is one such ground spot.

9) Mount the satellite board in a mechanically sound fashion inside the Multi-Pak. Make sure it cannot rattle around and cause shorts in other parts of the unit.

Printer Utility CoCo 3

MiniBanners

MiniBanners is an easy-to-use banner-making program written for the CoCo 3 with a disk drive and a printer. The program is menu-driven and supports both the 40- and 80-column screen formats. Version 1.1 contains 36 fonts, and others can be easily added. The various fonts included, such as Broadway, Byte, Colossal, Futura, Gothic, Italics, Roman, and Small provide your customized banner with unique styles. The program also lets you select the character used to form the message on your banner. This can be any character between ASCII 32 and 255. For instance if you want the letters to be formed out of asterisks (*), you would use 42.

MiniBanners allows you to print single-, double-, or multi-line banners on virtually any printer, including daisy-wheel printers. If you happen to have a printer that isn't the standard 80-column width, you can still use *MiniBanners* — one of the menu options lets you select your printer's printing width. A Font-Width option lets you determine how wide each letter on your banner should be. The Line-Spacing option is used to create space between printed lines on multiple-line banners. Also a Height option can be used to tell *MiniBanners* how tall to make each of the banner letters.

Defaults are used in *MiniBanners* so you can print a standard one-line banner without entering anything other than the banner message itself. The program automatically senses a multi-line banner if you type in a number smaller than the default.

MiniBanners' Main menu also lets you select the Configuration mode, so you can change the defaults to whatever you want. You will use this option to enter your printer's baud rate or to change any of the other displayed settings. When you are done, you can save the defaults to disk.

The Main menu and Configuration screens are clean, uncluttered, and self-explanatory. Both the 40- and 80-column screens are white on black and are sharp on my Tandy CM-8 monitor.

MiniBanners is not copy protected, so you can make a backup for your own protection. The six-page instruction booklet is well-written and easy-to-follow. *MiniBanners* is a nice addition to any CoCo 3 user's software library. I especially liked the multi-line printing capability, which is unique for a program of this type, and the many user-controlled inputs allow really nice-looking banners.

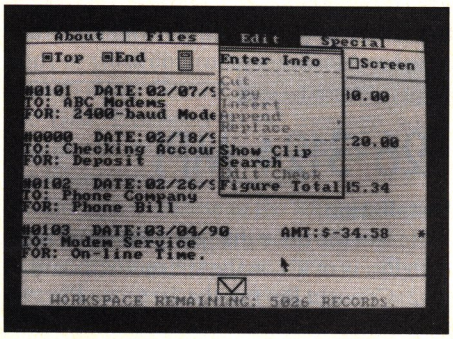
(Sub-Etha Software, P.O. Box 152442, Lufkin, TX 75915; $19.95 plus $2.50 S/H)

— Jerry Semones

Home Help CoCo 3

CheckBook+

When people buy a computer, often one of the first chores relinquished to it is balancing the checkbook. *CheckBook+*, as its name implies, is a program designed to accomplish this task.



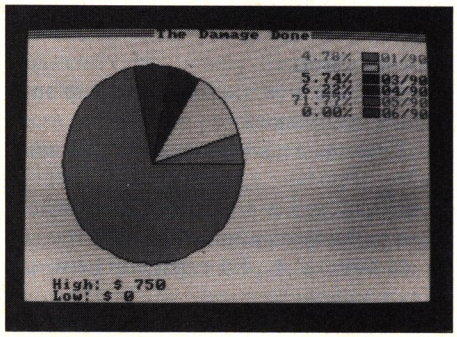
The Plus (not to be mistaken as a special money-generating feature) stands for the extra features added to this program that separate *CheckBook+* from other "vanilla" checkbook packages. These extra features include: A point-and-click interface; pull-down menus; a pop-up calculator; the option to graph data by the month or year using bar, line, or pie graphs; and a variety of ways to sort checks alphabetically and numerically, such as by company, item or amount.

The point-and-click interface works well. However, writing programs that require another commercial product (the Tandy High-Resolution Joystick Interface in this case) can limit your audience. Most functions require just a point-and-click, with the exception of some check, graphics, calculator, and file-naming tasks. This interface makes the program very easy to use, and you could essentially be using *CheckBook+* even before looking over the manual. However, the well-written nine-page manual does cover a handful of nonapparent features, so do take the few minutes necessary to read it. (Or you may end up like I did — stuck wondering how to get out of the pop-up calculator.)

A checkbook program wouldn't be complete without a calculator. A handy feature of the calculator built into *CheckBook+* is its ability to store a total, even after the calculator has been closed, allowing you to search for checking information then reenter the calculator and use a previous total. There are times when the calculator isn't necessary because graphics can display the information faster.

If you have an open file containing a minimum of three records, the graphics and sort options are accessible by clicking on the Special menu box. You can create a graph of information related to withdrawals, deposits or totals, from selected months or years. Simply enter the specific time frames and choose between a circle-, bar- or pie-graph presentation.

The sort options reposition the check entries several different ways, both alphabetically and numerically. Of course, before using these fancy options, you do have to perform the mundane task of entering the checking information.



Deposits show the date and amount. Withdrawals and checks can include date, amount, recipient and description information. Records are saved to disk and can be printed. Editing is accomplished by moving individual records onto a clipboard. Once on the clipboard, the record can be cut, copied, inserted, appended, or replaced. Available options appear in black, with

unavailable options shown in a grey highlight. A search routine helps you locate specific records quickly.

The extra features separate *CheckBook+* from other "vanilla" checkbook packages.

CheckBook+ can handle large files. The workspace accommodates files consuming more than one disk. Saving and loading files of this size is accomplished by swapping disks. With this process, you can use, at maximum, a file filling ten disks.

Using *CheckBook+* is simplicity itself. The screen display is uncluttered and appealing to the eye. If you want to change the screen-text font to one you already own (normal and IBM fonts are included with the package), you need to change the extension to .FNT. Fonts supplied with the *MiniBanners* program (reviewed in this issue) also work with *CheckBook+*.

Checkbook+ requires a CoCo 3, one or more disk drives, a Tandy High-Resolution Joystick Interface, and a mouse or joystick. It works with either a composite or RGB monitor, and supports output to a printer. CoCo 3's with 512K provide more room for in-memory transactions. Otherwise all functions are identical for 128K users.

In a nutshell, this a another fine program from Joel Matthew Hegberg.

Editors Note: Sub-Etha is working on OS-9 versions of both MiniBanners *and* CheckBook+. *Call or write for more information.*

(Sub-Etha Software, P.O. Box 152442, Lufkin, TX 75915, 409-639-3842; $24.95 plus $2.50 S/H)

— Jamie Hensen

Self-Education CoCo 1, 2 & 3

MicroMessage #1

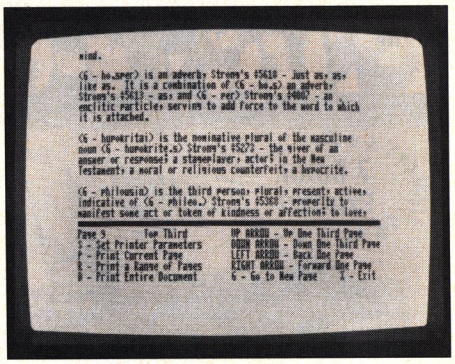
MicroMessage #1 is a bible-study program on disk. Simplicity and ease of use are its outstanding characteristics. The Main menu is always in view at the bottom of the screen, and you use the up- and down-arrow keys to advance through the pages of the study, one third of a page at a time. You can also move to any desired page by using only two keystrokes. The user may print any portion of the text or the whole study. This feature works flawlessly, as does the rest of the program. The study includes 19 pages of text.

MicroMessage #1 works on any CoCo with at least 64K, and requires a disk drive and printer. Because of the lack of screen clarity of televisions and color-composite monitors, a monochrome or RGB monitor is highly recommended. The documentation is only two pages but is quite adequate, and I encountered no difficulties whatever in using the program.

The particular study I reviewed was on the subject of prayer and covers Matthew 6:5-51. It would have been helpful if that text had been printed on the disk label, which instead simply carried the title "Prayer." As a working pastor with some thirty years experience, I found the study helpful. It begins with a couple of illustrations of prayer, proceeds with a verse-by-verse study of the text, and in the third section analyzes the words of the text by parts of speech and usage. The New Testament was originally written in Greek, so any in-depth study must consider the meaning of the original wording.

For a Pastor or serious bible student, *MicroMessage #1* can save a lot of work. The study presents the user with a grammatical analysis of each keyword and includes references to where and how the word is used elsewhere in the New Testament. In short, the study proceeds just as any study should, and it does most of the routine work for the user.

I give *MicroMessage #1* high marks for ease of use and competence of work. I would like to have a disk for any text on which I am to preach! At five dollars per disk, it is a bargain.


mind.
(G - ho.ape/) is an adverb, Strong's #5618 - just as, as, like as. It is a combination of (G - ho,) an adverb, Strong's #5613 - as, and (G - per) Strong's #4008 - an emphatic particle, serving to add force to the word to which it is attached.
(G - hupocritai) is the nominative plural of the masculine noun (G - hupocrites,) Strong's #5273 - the giver of an answer or response, a stage-player, actor, in the New Testament, a moral or religious counterfeit, a hypocrite.
(G - philousin) is the third person, plural, present, active, indicative of (G - phileo,) Strong's #5368 - generally to manifest some act or token of kindness or affection, to love,
Page 9 Top Third
S - Set Printer Parameters
P - Print Current Page
R - Print a Range of Pages
D - Print Entire Document
UP ARROW - Up One Third Page
DOWN ARROW - Down One Third Page
LEFT ARROW - Back One Page
RIGHT ARROW - Forward One Page
G - Go to New Page
X - Exit

(BDS Software, P.O. Box 485, Glenview, IL 60025-0485; $5)

— The Rev. Dr. Richard A. Olsson

Game CoCo 3

Monster Mash

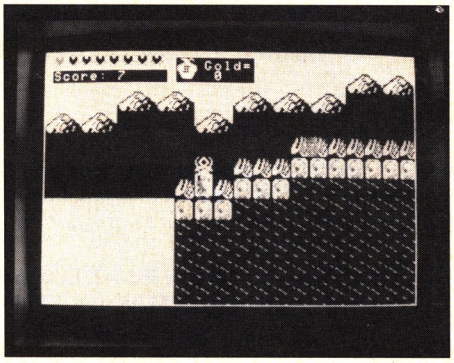
Monster Mash is an action-packed arcade game written for the CoCo 3 with a disk drive. It requires a joystick, and the graphics look best on an RGB color monitor, though the game supports color-composite monitors, as well. The program is written in machine language and features excellent 16-color, Hi-Res graphics that are reminiscent of some popular Nintendo games.

Loading *Monster Mash* is as simple as inserting the disk in the drive, and loading and executing the machine-language program. The title screen appears and an introductory tune is played. You must leave the disk in the drive during game play because frequent calls are made to load more screens.

In *Monster Mash*, you play the part of Kerwin, whose task is to find and conquer

the evil Medusa who has controlled the village for many years. The villagers had previously sent four of their strongest and bravest warriors to confront Medusa. They never returned because they had been transformed into hideous plant-like creatures. The magic mirrors they possess were broken during battle, but can be reassembled into one piece and used to defeat Medusa. The transformed warriors are willing to sell the pieces of mirror, but they want gold in exchange.

To win *Monster Mash* you must find the four transformed warriors and 10 sacks of gold before you can confront Medusa. There are some 70 rooms you can visit, and all are connected by doors so a map is vital if you want to do well. A map of the village is supplied in the two-page instruction manual but you will need to make a more detailed map as you venture into strange territories.



Kerwin is armed with magic swirls that can be fired with the joystick button. Kerwin has eight lives, which are displayed as hearts and are used up as he falls or gets hit by the evil guards, which are in the form of bats, floating mummies and Jack-O-Lanterns. The action is smooth, and Kerwin is easy to maneuver. Only a short delay of four to eight seconds halts game play whenever a new screen is loaded. This can be eliminated if you have 512K and a RAM disk, allowing quicker screen changes. If you need, you can pause game play with the P key.

There are a lot of other features in *Monster Mash* that make it a real challenge and fun-to-play. You'll have to play the game in order to discover some of these other surprises. I can assure you that you won't find it boring.

(Biware Enterprises, c/o Kandi Stinson, Box 265, Allen, OK 74825; $22)

— Robert Gray

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Game	CoCo 3

Deception Path

Deception Path is a plainly pleasant, provocative, positively perplexing puzzle phenomena. It is solved as easily as saying the previous sentence three times in rapid succession without tripping over your tongue. In essence, all you have to do is navigate through the passages of a maze, pick up designated treasures, and return. There are no monsters to slay, bombs to avoid, spells to be cast or time limits to meet. So what's the big deal, you ask? The problem is that the passages continually change, and what looked like an easy path to your treasure is suddenly a dead end, forcing you to search or build another path.

The playing field, or maze, consists of a 7-by-7 grid and 50 playing tiles. This means there is always one extra tile, which sits outside the maze, with a passage on it. Using the joystick, the free tile can be rotated and positioned on the perimeter of the maze and slid into a new row or column. If strategically done, this will allow you to advance your playing piece and reach your assigned treasure.

The game can be played by one to four players. Each player is allowed, in turn, to shift or rotate one tile or portion of the playing field. Doing this will (hopefully) enable him to reach the treasure. In the case of a single-player game, the computer (in its diabolical way) randomly rotates a

number of tiles, often ruining the best laid plans.

Each player has an onscreen status box that displays objects retrieved and the next treasure to be picked up. A color bar at the top indicates whose turn it is, but does not allow a player's name to be entered. Each player has to remember the rotation of his turn or his designated color. The game ends (without any fanfare, fuss or ado) when every player has found and retrieved his treasures. There are no scores, timers, bells or whistles when the task is completed. It is somewhat like running the marathon; just finishing is reward enough. While the lack of a score takes away the challenge to better oneself in a future game, *Deception Path* is a cute, non-violent game that requires some strategy and a bit of luck, and is a delightful way of spending an hour with your CoCo. It does require a CoCo 3, a disk drive and a joystick.

***Deception Path* is a plainly pleasant, provocative, positively perplexing puzzle phenomena.**

(Eversoft Games Ltd., P.O. Box 3345, Arlington, WA 98223-3354; $19.95, plus $2.50 S/H)

— George Aftamonow

Programming OS-9

Math.l Supplement

I am pleased to report that I have received a supplement to the *Math.l* library from Bits-N-Bytes. In my previous review of the *Math.l* library (April 1991, Page 66), I complained about the lack of a functional index and the lack of a header file to prototype each of the math functions. The lack of a header file forced the programmer to manually prototype each math function.

Included with the supplement is a plastic-coated quick-reference card listing all of the math functions and the page number on which the function appears in the manual. Also included on the quick-reference card is a complete function prototype listing the data types for parameters and the data type of the returned value, as well as the valid range of parameters. The quick-reference card is a very nice touch that I think is above and beyond the call of duty, per se. The inclusion of this information at the back of the manual would have sufficed nicely, but I'm not going to complain lest Bits-N-Bytes changes its mind.

The disk includes a `math.h` file that not only contains the prototypes for each of the math functions, it also defines alternate names for the math functions. Instead of using `csc()` and `csch()`, for example, you can use `cosec()` and `hypcosec()`. Although the original version of the math library was a nice addition to your C library, it is even better with the quick-reference card and header file.

(Bits-N-Bytes, 4046 Wilson Creek Road, Port Orchard, WA 98366; included with *Math.l* package)

— Greg Law

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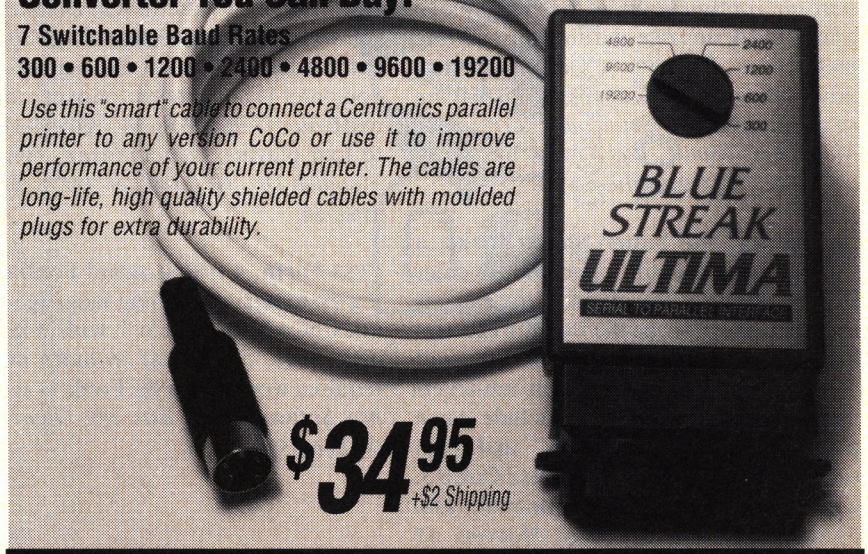

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Received and Certified

The following products have recently been received by THE RAINBOW, examined by our magazine staff and issued the Rainbow Seal of Certification, your assurance that we have seen the product and have ascertained that it is what it purports to be.

CoCo Tools, a comprehensive set of disk utilities for Disk BASIC. File commands allow you to: Archive, copy, kill, edit, move, compare, purge, rename, salvage and unarchive files. Disk commands available support: Backup, directory, gran analysis, disk edit, initialize disk, rejuvenate disk, verify, erase, write sorted directory and disk-speed check. Over a dozen other options included. Multiple-file operations can be carried out with a few keystrokes. *CoCo Tools* has automatic diagnosis and repair capabilities for fixing file-allocation errors and directory information. Allows for a start-up configuration of display colors, printer baud, step rate and directory-sorting preferences. Requires a CoCo 3, a disk drive and a monitor capable of displaying 80-column text. *Cer-Comp LTD, 5566 Richochet Avenue, Las Vegas, NV 89110, (702) 452-0632; $49.95 plus $4 S/H.*

◈ **Sidney, the Super Space Snake**, a fast-paced arcade game with 16-color Hi-Res graphics. The object of the game is to help Sidney escape the floating Electro-Prison by consuming Electropods. You must survive 33 increasingly difficult sub-levels to win the game. Features include game pause, unlimited "continues" and high scores retained on disk. Requires a CoCo 3, a disk drive and an RGB monitor. *KLG Systems, 38 Clove Rd. #204, Monroe, NY 10950, (914) 783-2950; $14.95 plus $2 S/H.*

HideScreen 1.0, hides CoCo 3 graphics screens in unused memory locations. Screens can later be recalled. Hides 13 HSCREEN2 or HSCREEN4 screens, 26 HSCREEN1 or HSCREEN3 when used with a 512K CoCo 3, half these amounts with a 256K machine, and only one HSCREEN1 or HSCREEN3 screen in 128K. It is strongly recommended you have 256K or 512K when using this utility. Complete with graphics demo (at least 256K required to run the demo). *N*Johnson Software, 5830A Reinke Drive, Crestview, FL 32536, (904) 682-2907; $7.95.*

CoCo Cassette #107, a variety of programs presented monthly for the CoCo 1, 2 and 3. This month includes: *Desert Storm*, you are commander-in-chief in this battle simulation; *Business Profit Planner*, project expenses for starting your own business; *The Ultimate Ruler*, see how well you can manage a small Agrarian society; *Math Derby*, an educational program for beginning math students; *Blood Pressure Database 3*, keep track of your blood pressure throughout the day or week; *Cobra Attack*, a graphics helicopter attack game; *Monogram*, a program that draws a large monogram for fancy letterheads; *Country Club Adventure*, a text adventure; *Screen Blanker*, automatically blanks the screen if the computer is unattended for over a minute; and *Color Golf*, a Tom Mix favorite for one to four players. *T&D Software, 2490 Miles Standish Dr., Holland, MI 49424, (616) 399-9468; $8.*

CF83 Forth, a 1983-standard Forth operating system/programming language for the 64K CoCo 2, or a CoCo 3, with at least one disk drive. *CF83* itself includes only the required word set for the Forth-83 standard. *BDS Software, P.O. Box 485, Glenview, IL 60025-0485; $17.*

CF83-3 Block Editor, *CF83 Forth*'s screen-oriented block editor. Use of this product requires that you have *CF83 Forth*, also from BDS Software. *BDS Software, P.O. Box 485, Glenview, IL 60025-0485; $18.95, $15.00 with the manual on disk only.*

CF83-1 Technical Reference Manual, this is the detailed reference for *CF83 Forth*. As such, it is intended for users of *CF83 Forth*, also from BDS Software. This manual can be purchased in hard-copy form or on disk only. *BDS Software, P.O. Box 485, Glenview, IL 60025-0485; $17.25, $10.00 for the disk version.*

◈ **Discaide**, a utility program for analyzing disk data. A few of the features included are: Inspection of an OS-9 disk while in Disk BASIC; listing allocated granule information; clear sector garbage; maximizing use of disk space; and list complete directory, including first granule and end bytes. Requires a 35-track disk drive, Disk BASIC 1.1 or 2.1 (a CoCo 2 or CoCo 3), and a printer. *The Homebiz Funware Company, 48 South 11th St., Richmond, IN 47374; $24.95, $19.95 introductory offer.*

◈ **First product received from this company**

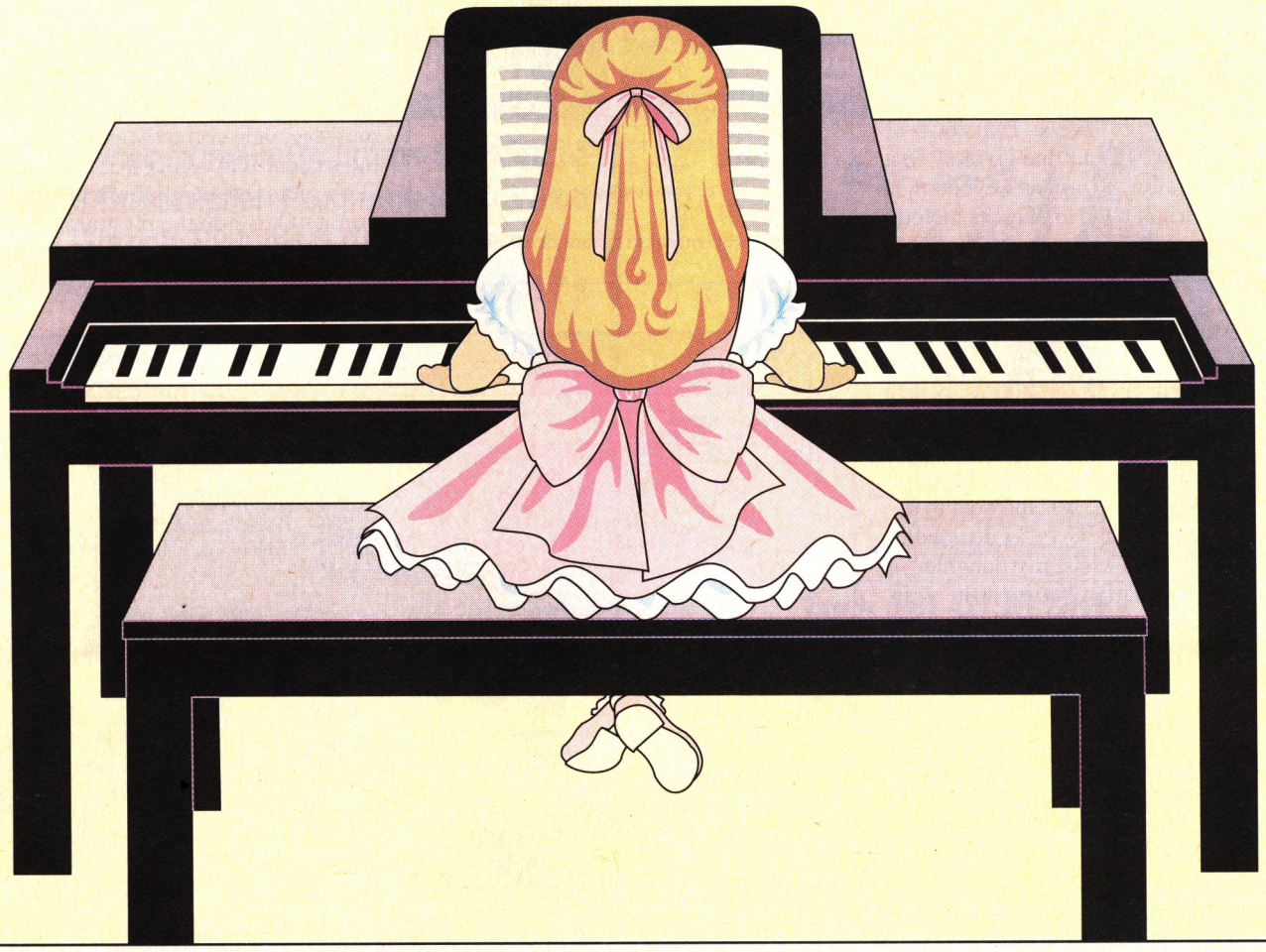
The *Seal of Certification* is open to all manufacturers of products for the Tandy Color Computer, regardless of whether they advertise in THE RAINBOW.

By awarding a *Seal*, the magazine certifies the program does *exist* — that we have examined it and have a sample copy — but this *does not* constitute any guarantee of satisfaction. As soon as possible, these hardware or software items will be forwarded to THE RAINBOW reviewers for evaluation.

Music Tutor

by William K. Miller

Learn to read music with a CoCo quiz for every good boy (or girl) who does fine



A	general FOR/NEXT variable
BC$	bass-clef notes
BF	graphic buffer
CC	flag for bass/treble clef
JP	joystick value
KN	keyboard/note flag
MS	message number
MS$()	screen message array
N	position in note string
N$	current note string
N()	note values in CoCo format
NN	vert. position for graphic
NO$	current note for PLAY
NT	target keyboard position for note displayed
OC	octave
OC$	octave for PLAY
OE	odd/even flag
PL	random position in N()
PX	horizontal screen position for messages
PY	vertical screen position for messages
Q$	INKEY variable
T	general FOR/NEXT variable
TC$	treble clef notes
TN	length of note string
X	horiz. position of graphic
Y	vert. position for graphic
Z	general FOR/NEXT variable

Figure 1: Program Variables

A short time ago my daughter decided to learn how to play the organ. The keyboard on our organ is divided into three levels: Two rows of keys and one level of foot pedals. Generally the upper keyboard is used with the right hand to play the melody in the treble clef. The lower keyboard is used with the left hand to play chords in the bass clef. The foot pedals are used for notes in the bass clef that are played with the rhythm.

For the beginner, all these keys, pedals and corresponding notes can be somewhat overwhelming. When playing the music, there is no time for the student to think "This note is middle C. It is the note to the left of these two black keys." I decided to write *Note Tutor* to assist my daughter in learning the correlation between the written notes on a sheet of music and the corresponding keys on the keyboard, as well as learning of the name of each note.

Note Tutor is designed to place a randomly selected musical note on a staff. The student then either names the note or indicates which key goes with the note. This is done using either a mouse or a joystick to move a pointer to the correct key/pedal.

Lines	Description
10-130	set screen requirements and dimension buffers and variables
140-560	draw graphics on screen and place in buffers
570-730	display user choices onscreen and get responses
740-780	main loop; pick random note from Array N()
790-850	determine octave of selected note and set OC$ for use with the PLAY command
860-940	determine which graphic (odd/even and stem up/stem down) to use
950-980	display graphic, PLAY the note and jump to Line 1010 for position or Line 1120 for naming
990-1040	get user response for note or Quit, and check for right/wrong
1050-1110	clean the screen and jump to get another random note (Line 770)
1120-1170	joystick input for position and keyboard for Quit checked
1180-1190	set target position for joystick cursor and check user response from mouse/joystick
1200-1230	handle incorrect response from mouse/joystick and jump to Line 770 for another note
150-290	subroutines: a) get key pressed b) print message MS from Array MS$() at PX,PY c) erase message

Figure 2: General Program Breakdown

The CoCo 3 is ideally suited for this task because it allows programs to mix graphics and text, provides a sound output, and accepts mouse or joystick input. I hope the learning process will become more automatic when you start using *Note Tutor*.

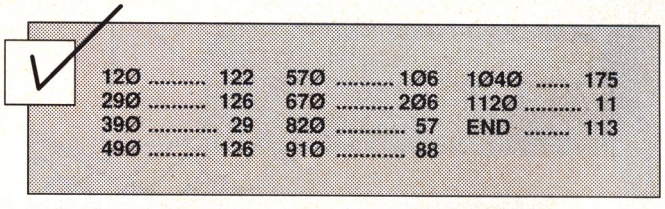
General Instructions

After the program starts, a musical staff appears onscreen in the upper-left corner, and a dialog box appears in the upper-right corner. The two keyboard rows and the pedals appear in the lower part of the screen. At this introductory screen, the dialog box prompts the student for which clef he wants to use, treble or bass. The student makes this choice by pressing T or B. The range for the treble clef is three octaves, starting from F below middle C. This range is covered by the upper keyboard on the screen. The bass clef is covered by the lower keyboard and pedals, and ranges from F above middle C to more than three octaves below that.

After selecting the clef, the user is asked whether he wants to *name* the notes randomly shown on the staff or *indicate their positions* on the keyboard. This choice is made by pressing N to name the notes, or K to indicate keyboard positions. If the student presses N in response to this prompt, a randomly selected note appears on the staff. He must then press the key that corresponds to the musical name of the note. If the note is correctly named, the note is omitted from subsequent random selections. *Note Tutor* indicates incorrect responses with a short message, then correctly names the note for the student. This process is continued until all the notes are named correctly or the user presses Q to stop the program.

If the student presses K (to indicate keyboard position), the computer again

CoCo 3



The Listing: NOTETUTR

```
10 'NOTE TUTOR
20 'WRITTEN BY WILLIAM MILLER
30 'COPYRIGHT (C) OCTOBER 1991
40 'BY FALSOFT, INC.
50 'RAINBOW MAGAZINE"
60 ' INTRO MEMORY, SCREEN
70 '
80 RGB:PALETTE1,0:PALETTE 0,63:D
IMN(22),MS$(11):HSCREEN4:HBUFF1,
100:HBUFF2,100:HBUFF3,100:HBUFF4
,100:HBUFF5,500:HBUFF6,1000:HBUF
F7,1000:HBUFF8,500:HBUFF9,500:TC
$="FGABCDEFGABCDEFGABCDEF":BC$="
CDEFGABCDEFGABCDEF":CC=1:X=112
85 HPRINT(35,1),"NOTE TUTOR":HPR
INT (34,2),"WKM Software":HPRINT
(38,3),"7/91"
90 '
```

William K. Miller is a teacher of special-needs students. He enjoys using his computers, two CoCo 3's and a Tandy 1000, to write programs for his children and his students. He can be contacted at 19 Barefoot Hill Road, Sharon, MA 02067. Please include an SASE when requesting a reply.

randomly places a note on the staff. Using a mouse or joystick, the student must put the blinking-line cursor over the correct key and press the fire button. Correct and incorrect responses are handled in the manner described above.

Other Possibilities

The variables I used in *Note Tutor* are shown in Figure 1. Figure 2 provides a very general description of the routines involved in the program. Two enhancements programmers may want to add to *Note Tutor* are the addition of accidentals (sharps and flats), and a provision for naming the hand positions for chords. Then again, that could be another complete program.

I hope you enjoy using *Note Tutor* as much as I enjoyed writing it. ❑

```
100 ' MESSAGES
110 '
120 MS$(1)="Choose one":MS$(2)="
<T>reble Clef":MS$(3)="<B>ass Cl
ef":MS$(4)="Find <N>ote":MS$(5)=
"Find <K>eyboard position":MS$(6
)="Note:":MS$(7)="Press <Q> to q
uit":MS$(8)="Keyboard Position":
MS$(9)="Sorry, the note is: "
130 MS$(10)="Correct":MS$(11)="S
orry, the key is:"
140 GOTO300
150 '
160 ' SUBS
170 '
180 '    INKEY
190 Q$=INKEY$:IFQ$=""THEN 190 EL
SE RETURN
200 '
210 ' PRINT MESSAGE
220 '
230 HPRINT(PX,PY),MS$(MS):RETURN
240 '
250 ' ERASE MESSAGE
260 '
270 HCOLOR0:GOSUB230:HCOLOR1:RET
URN
280 '
290 '
300 '   DRAW STAFF
310 '
320 FORZ =59 TO 31 STEP-7:HLINE(
10,Z)-(210,Z),PSET:NEXT:HLINE(10
,31)-(10,59),PSET:HLINE(11,31)-(
11,59),PSET:HLINE(16,31)-(16,59)
,PSET:HGET(180,0)-(194,90),5
330 '
340 ' DRAW KEYBOARD
350 '
360 FORZ=0TO21:FORA=0TO1:HLINE(1
95+20*Z-A*140,70+A*40)-(215-A*14
0+20*Z,100+A*40),PSET,B:IFZ=3 OR
 Z=6 OR Z=10 OR Z=13  OR Z=17 OR
 Z>19 THEN 370 ELSE HLINE(211+20
*Z-A*140,70+A*40)-(220+20*Z-A*14
0,85+A*40),PSET,BF
370 NEXT A,Z
380 FORZ= 0 TO 6:HLINE(2+20*Z,15
0)-(12+20*Z,180),PSET,B:IF Z=2 O
R Z=6 THEN 390 ELSE HLINE(15+20*
Z,150)-(19+20*Z,170),PSET,BF
390 NEXT
400 '
410 ' DRAW BASS CLEF
420 '
430 HGET(25,25)-(73,65),6:HCIRCL
E(32,38),5:HPAINT(33,37),1,1:HPA
INT(33,39),1,1:HCIRCLE(44,38),16
,1,1,.47,.15:HDRAW"BM58,42;L2D2L
2D2L2":HCIRCLE(29,40),27,1,1,.1,
.25:HCIRCLE(68,35),3:HPAINT(68,3
5),1,1:HCIRCLE(68,41),3:HPAINT(6
8,41),1,1
440 HGET(25,25)-(73,65),7:HPUT(2
5,25)-(73,65),6
450 '
460 ' DRAW TREBLE CLEF
470 '
480 HCIRCLE (44,53),12,1,1,.45,.
28:HCIRCLE(42,51),18,1,1,.28,.70
:HDRAW"BM32,45;R2UR2UR2UR2UR2UR2
UR2UR2;U2R2U2R2U2R2;U3LULULUL3DL
DLDLD33L2DL2DL4U2RDLU":HGET(25,2
5)-(73,65),6
490 '
500 '   INTRO NOTES
510 HCIRCLE (100,56),5:HPAINT(10
0,56),1,1:HLINE(104,59)-(104,42)
,PSET:HLINE(105,59)-(105,42),PSE
T:PLAY"03;F"
520 HCIRCLE (120,52),5:HPAINT(12
0,51),1,1:HPAINT(120,53),1,1:HLI
NE(124,54)-(124,35),PSET:HLINE(1
25,54)-(125,35),PSET:PLAY"03;G"
```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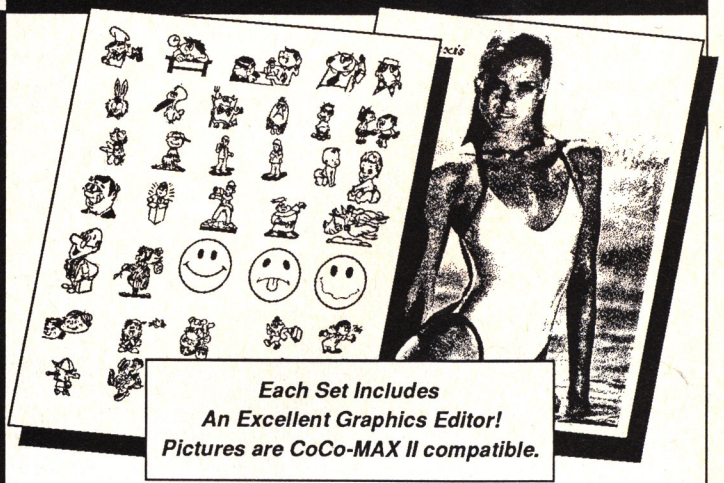

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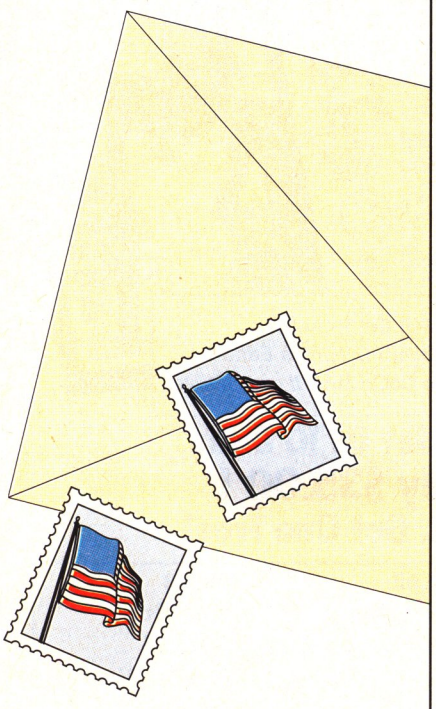

```
530 HCIRCLE (145,42),5:HPAINT(14
5,42),1,1:HLINE(140,40)-(140,57)
,PSET:HLINE(139,40)-(139,57),PSE
T:PLAY"O4;C"
540 HCIRCLE (165,38),5:HPAINT(16
5,39),1,1:HPAINT(165,37),1,1:HLI
NE(160,36)-(160,53),PSET:HLINE(1
59,36)-(159,53),PSET:PLAY"O4;D"
550 HGET(92,62)-(106,41),1:HGET(
112,58)-(126,37),2:HGET(150,39)-
(136,60),3:HGET(170,34)-(156,55)
,4
560 '
570 ' CHOOSE TREBLE CLEF OR BASS
 CLEF AND CHOOSE KEYBOARD OR NOT
E
580 '
590 HLINE(415,30)-(635,61),PSET,
B:HLINE(415,30)-(635,61),PSET,B:
HLINE(415,30)-(633,60),PSET,B:PX
=53:PY=4:MS=1:GOSUB230:PX=55:PY=
5:MS=2:GOSUB230:PY=6:MS=3:GOSUB2
30
600 GOSUB190
610 IF Q$="T"THEN CC=1 ELSE IF Q
$="B" THEN CC=2 ELSE 600
620 GOSUB270:PY=5:MS=2:GOSUB270
630 PX=55:PY=5:MS=4:GOSUB230:PY=
6:MS=5:GOSUB230
640 GOSUB190
650 IFQ$="N"THEN KN=1 ELSE IF Q$
="K"THEN KN=2 ELSE 640
660 HPUT(112,0)-(126,80),5:HPUT(
92,0)-(106,80),5:HPUT(136,0)-(15
0,80),5:HPUT(156,0)-(170,80),5
669 PL=1
670 GOSUB270:PY=5:MS=4:GOSUB270:
PX=53:PY=4:MS=1:GOSUB270:PX=55:P
Y=6:MS=7:GOSUB230:IFKN=1THEN PX=
55:PY=4:MS=6:GOSUB230 ELSE PX=55
:PY=4:MS=8:GOSUB230
680 '
690 ' INITIALIZE  NOTE BUFFER
700 '
710 IF CC=1 THEN N$=TC$:HPUT(25,
25)-(73,65),6 ELSE N$=BC$:HPUT(2
5,25)-(73,65),7
720 FORZ=1TO22:N(Z)=Z:NEXT:IFCC=
1 THEN TN=22 ELSE TN=18
730 '
740 ' MAIN LOOP
750 '
760 '      GET RANDOM NOTE
770 PL=RND(TN):N=N(PL)
780 NO$=MID$(N$,N,1):IF CC=1 THE
N 830
790 '
800 ' DEFINE OCTAVE
810 '
820 IF N>14 THEN OC=3 ELSE IF N>
7 THEN OC =2 ELSE OC=1
821 GOTO840
830 IF N>18 THEN OC=5 ELSE IF N>
11 THEN OC=4 ELSE IF N>4 THEN OC
=3 ELSE OC =2
840 OC$="O"+STR$(OC)
850 OE=(N-2*(INT(N/2))):IFCC=2 T
HEN 910
860 ' TREBLE CLEF DEFINE NOTE VA
RIABLES
870 IF OE=1 AND N<11 THEN BF=2 E
LSE IF OE=0 AND N<11 THEN BF=1 E
LSE IF OE=1 AND N=>11 THEN BF=4
ELSE BF=3
880 IF N>10 AND OE=0 THEN Y=98 E
LSE IF N>10 AND OE=1 THEN Y=97 E
LSE Y=86
890 GOTO 930
900 ' BASS CLEF DEFINE NOTE VARI
ABLES
910 IF  OE=1 AND N<9 THEN BF=2 E
LSE IF OE=0 AND N<9 THEN BF=1 EL
SE IF OE=1 AND N=>9 THEN BF=4 EL
SE BF=3
920 IF N>8 AND OE=0 THEN Y=91 EL
SE IF N>8 AND OE=1 THEN Y=90 ELS
E Y=79
930 NN=N-1
940 '
950 ' PUT NOTE ON STAFF
960 '
970 HPUT(X,Y-INT(3.5*NN))-(X+14,
Y-21-INT(3.5*NN)),BF:PLAY OC$+";
"+NO$:IFKN=2 THEN1120
980 '
990 'CHECK ANSWER FOR FIND NOTE
1000 '
1010 GOSUB190
1020 IF Q$="Q" THEN END ELSE IF
Q$<"A" OR Q$>"G" THEN 940
1030 HPRINT(61,4),Q$
1040 IF Q$<>NO$ THEN SOUND100,2:
SOUND50,3:HCOLOR3:PX=55:PY=5:MS=
9:GOSUB230:HPRINT(75,5),NO$:FORT
=1TO1000:NEXT:GOSUB270:HCOLOR0:H
PRINT(75,5),NO$:HPRINT(61,4),Q$:
HCOLOR1:HPUT(X,0)-(X+14,90),5:GO
TO760
1050 ' RIGHT ANSWER
1060 SOUND200,1:FORT=1TO50:NEXT:
SOUND200,1:HCOLOR2:PX=55:PY=5:MS
=10:GOSUB230:FORT=1TO500:NEXT:GO
SUB270
1070 FORZ=PL TO 21:N(Z)=N(Z+1):N
EXT:TN=TN-1:GOSUB270:IF TN=0 THE
N HCOLOR0:HPRINT(61,4),Q$:HPRINT
(75,5),NO$:HCOLOR1:HPUT(X,0)-(X+
14,90),5:PX=55:PY=5:MS=10:GOSUB2
70:PY=4:MS=6:GOSUB270:PY=6:MS=7:
GOSUB270:PX=55:PY=4:MS=8:GOSUB27
0:GOTO590
1080 FORT=1TO500:NEXT:PX=55:PY=5
:MS=9:GOSUB270:HCOLOR0:HPRINT(75
,5),NO$
1090 IFKN=1 THEN HPRINT(61,4),Q$
1100 HCOLOR1:HPUT(X,0)-(X+14,90)
,5
1110 GOTO770
1120 '
1130 ' CHECK ANSWER FOR KEYBOARD
 POSITION
1140 '
1150 Q$=INKEY$:IFQ$="Q" THEN END
1160 JP=JOYSTK(0):IF INT(JP/2)*2
<>JP THEN JP=JP-1
1170 HGET(6+JP*10,70)-(6+JP*10+5
,180),9:HLINE(6+JP*10,70)-(6+JP*
10+1,180),PSET,BF:HPUT(6+JP*10,7
0)-(6+JP*10+5,180),9:IF BUTTON (
0)=0 THEN 1150
1180 HCOLOR3:IF CC=1 THEN NT=(N+
9)*2 ELSE NT=(N-1)*2
1190 IF NT=JP THEN 1060
1200 'WRONG ANSWER
1210 PX=55:PY=5:MS=11:GOSUB230
1220 SOUND100,2:SOUND50,3:FORT=1
TO10: HGET(6+NT*10,70)-(6+NT*10+
5,180),9:HLINE(6+NT*10,70)-(6+NT
*10+1,180),PSET,BF:HPUT(6+NT*10,
70)-(6+NT*10+5,180),9:NEXT:HCOLO
R1
1230 PX=55:PY=5:MS=11:GOSUB270:H
PUT(X,0)-(X+14,90),5:GOTO770
```

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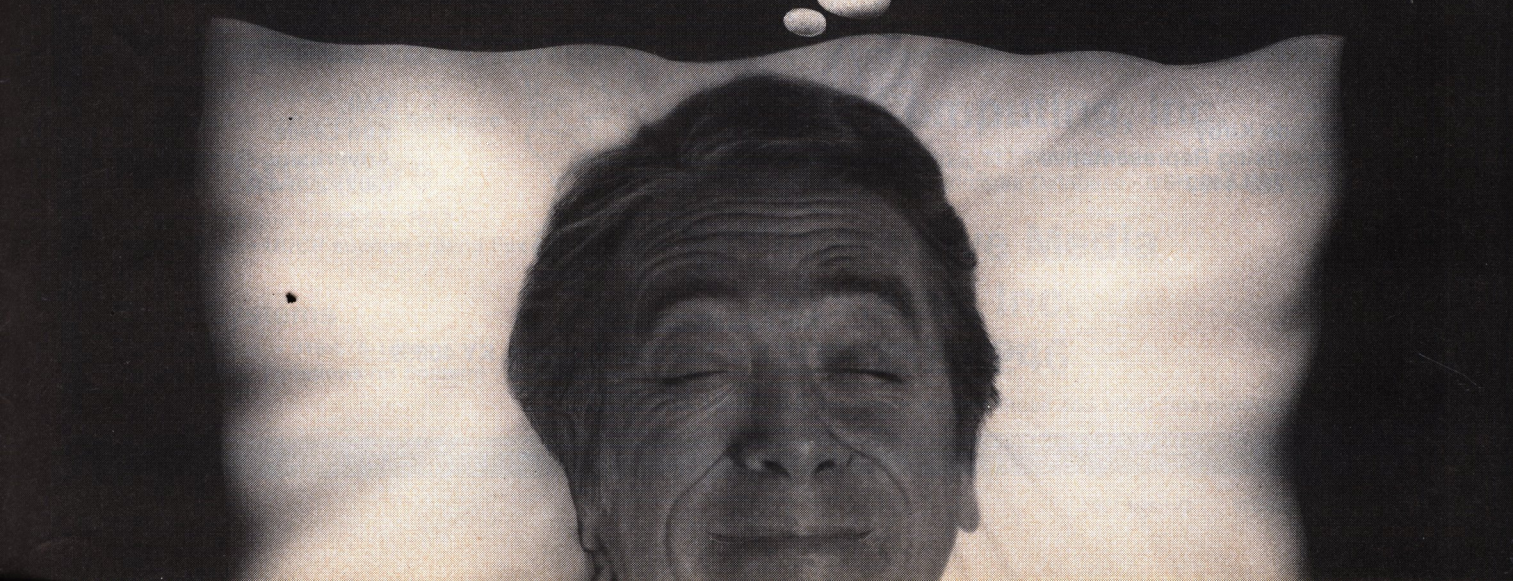

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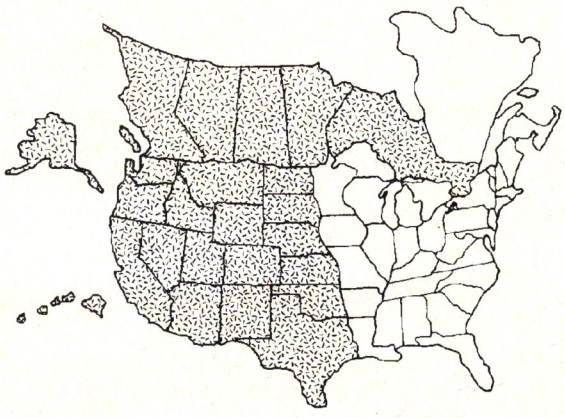

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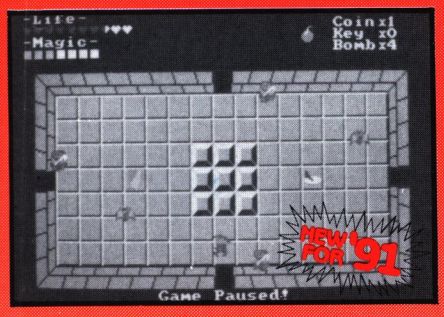
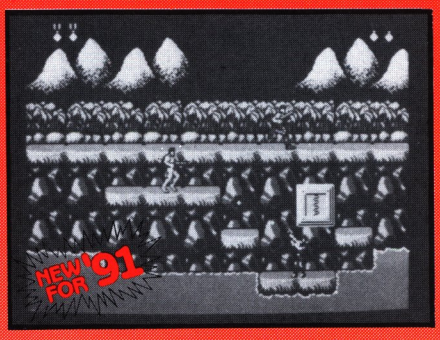


Better men than you have failed the quest, but the hand of the good princess Thelda is too much to resist! Stolen by the evil necromancer Divinax, she has been secreted far from prying eyes and it is now up to you to regain the pieces of the mystical Life Force and save the fair lady. The Quest for Thelda is an outstanding arcade program that combines action and adventure to bring you an incredible video game playing experience. Travel throughout over 500 different screens searching for magical objects and spells, fighting horrible creatures, and gathering the various parts of the Life Force guarded by ever-increasing terrors. You'll enjoy the highest quality 320x200 resolution 16 color graphics and digital sound effects that you've come to expect from Sundog Systems. The game play is fast and furious, and only you can rescue the princess and complete the **LEGEND OF THELDA!** Req. 128K CoCo 3, disk drive, and joystick (2-button joystick supported).

$34.95

Hint book now available for Thelda! Contains clues, maps, and even a BASIC program to modify your own characters! **$4.95**

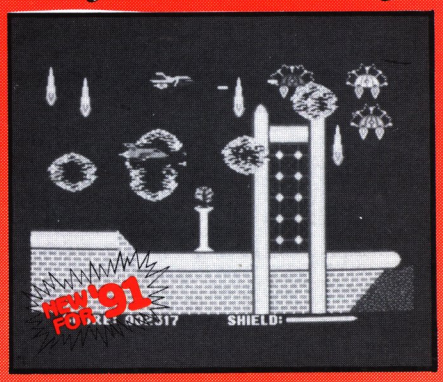
THE CONTRAS



In the year 2671, a mysterious object landed on Earth, heralding the alien invasion of the Red Falcon. Only two courageous soldiers have a hope of stemming this alien infestation. Armed with your military training and the latest weapon technology, you and a friend must fight back the horde. Sundog Systems presents our second 512K game, **The Contras.** You'll see why we decided to use 512K on this project! Amazing graphics with 320x225 resolution, 16 color full screen animation and horizontal smooth scrolling! Background digital sound effects and real-time music! One or two player action AT THE SAME TIME! You'll agree that this is one of the best arcade games yet for your 512K CoCo 3. Needless to say, playing hero won't be easy; playing The Contras will be tougher! Req. 512K CoCo 3, disk drive, and 2-button joystick.

$34.95

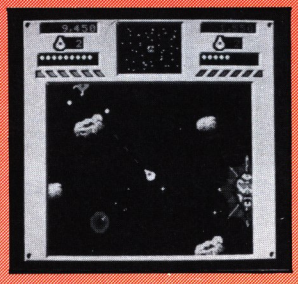
Crystal City



The superior technology of the evil Overlords has ensnared yet another innocent planet; however, this one contains the Crystal City, bastion of democracy and independence. Earth has had enough! Break through level upon level of their virtually invulnerable defenses, defeat the end guardians, and make your way ever closer to freeing the slaves of the Crystal City! This amazing arcade game is an achievement in its own right. Full 128K/512K utilization! Super fast horizontal hardware scrolling on the 128K computer! Wild digital sound effects and background music score! 30 minutes, or over 30 megabytes, of non-repeating 320x200 resolution, 16 color graphics! This game has it all; order a demo disk to see it first! Can you save the Crystal City from unbeatable foes? Req. 128K CoCo 3, disk drive, and joystick.

$34.95

Sinistaar



You've raved about this 512K arcade game! The graphics and animation are amazing! You've got to hear the digital sounds! 512K (three disks) packed with excitement. 512K CoCo 3 only. $34.95

KYUM-SAI TO BE NINJA

This martial arts arcade game remains a CoCo 3 phenomenon. One of our best sellers to date! Play the incredible combat experience that you've been missing, and call for the availability of the OS-9 version. 128K CoCo 3 action. $29.95.

OS-9 Version Now Available

SOUNDTRAX

This 128K/512K sound sequencing system has become an immensely popular program. Create musical scores using polyphonic digitized sounds and a user-friendly point and click editor. Call to order the SoundTrax demo program, and get 10% off your purchase with receipt. $34.95

Now Available: SoundTrax instrument sample disks! Guitars, strings, woodwinds, and just plain weird instruments for your composing pleasure. Completely compatible with the SoundTrax system. 3 flippy (2 sides) disks full of sounds. $12.95 each or $29.95 for all three.

Zenix

You have been chosen to pilot the spacecraft wielding the plutonium plasma laser against the nefarious insectoids, the Zenians. These bugs have been ripping off the space trade lines for years; now they're about to find a victim who can fight back! Beat back the swarm of pests to their home planet Zenix, and use the laser to end the menace once and for all. Zenix is a lightning fast arcade game for the 128K CoCo 3. The 320x225 16 color graphics are amazing, as are the digital background music score and effects, all on a 128K computer! The fast action and game play will astound you in this GALAGA of extermination. Plug in your joystick and strap in for the ride of your life! Call to order a demo disk to see the action before you buy! Req. 128K CoCo 3, disk drive, and joystick.

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Visa, Mastercard, Check, Money Order, and COD (USA only, please) accepted. All foreign orders must be sent in US currency Money Orders. Include $2.50 for shipping in USA and Canada. $5.00 Foreign. $3.00 extra for COD orders. PA residents add 6% sales tax. Dealer inquiries welcome. Authors: we're looking for new software!

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